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# Olivo-cerebellar circuit. Structure and functions

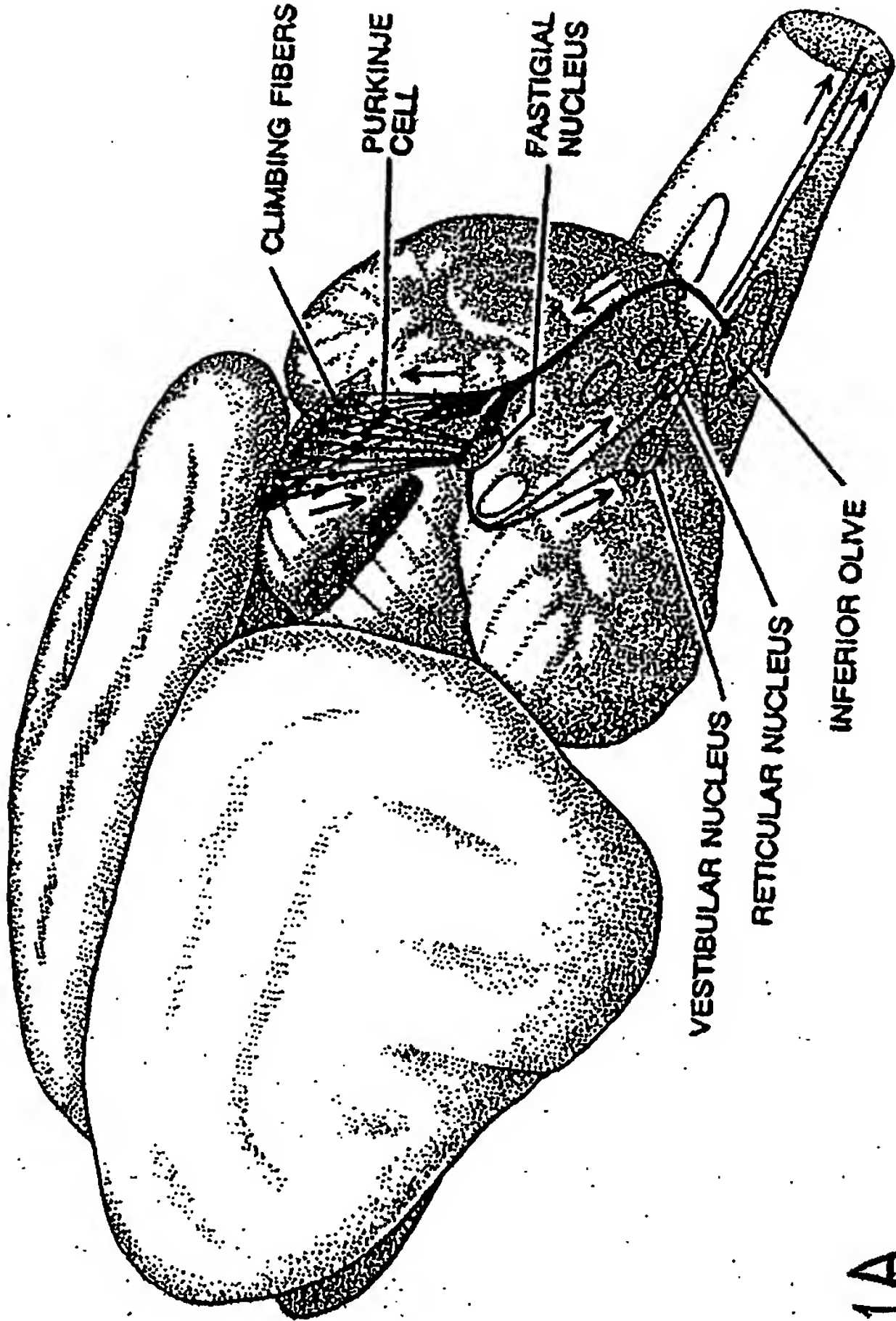


FIG. 1A

Olivo-cerebellar feedback loop.

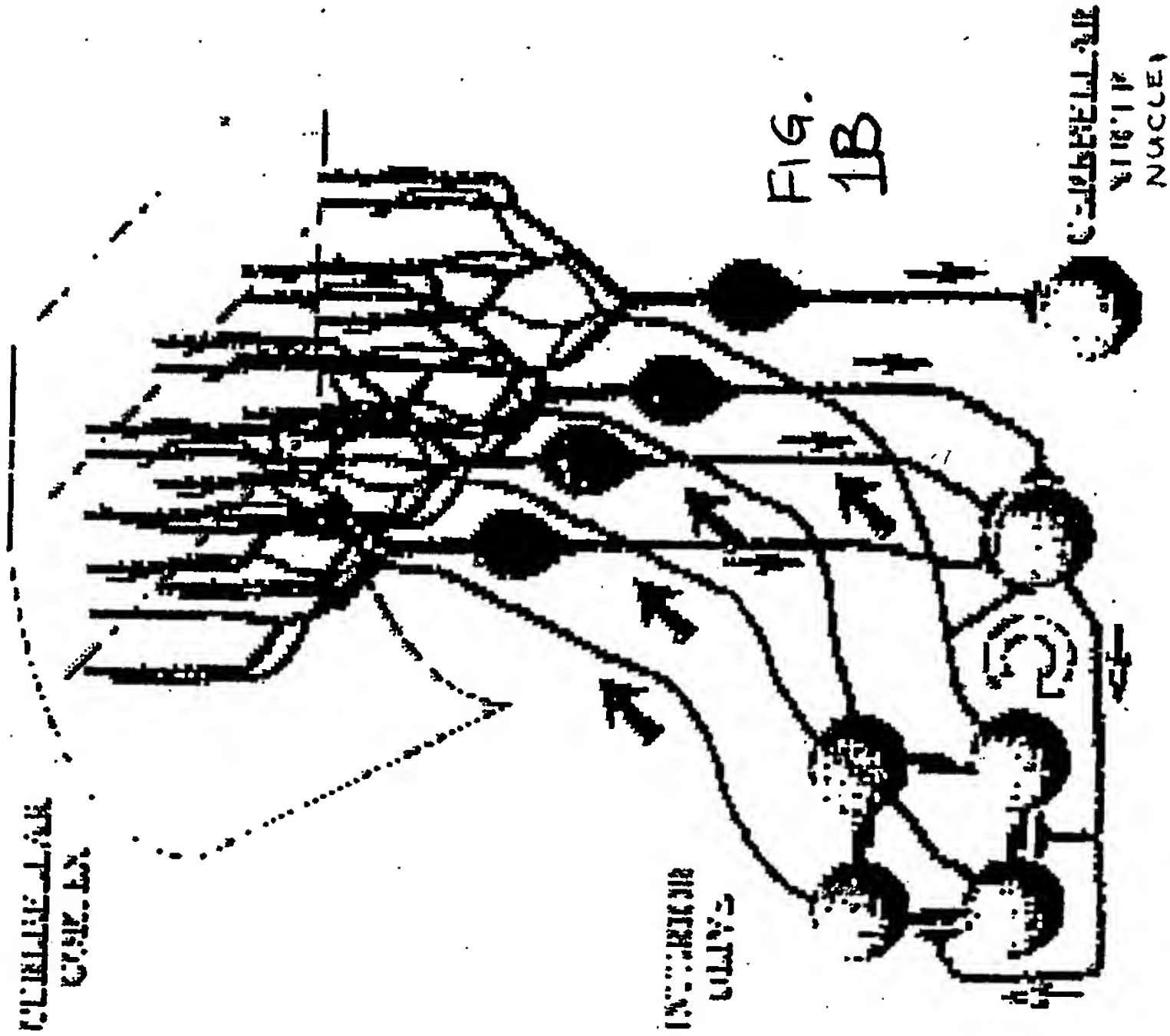


FIG. 1B

Functional circuit.

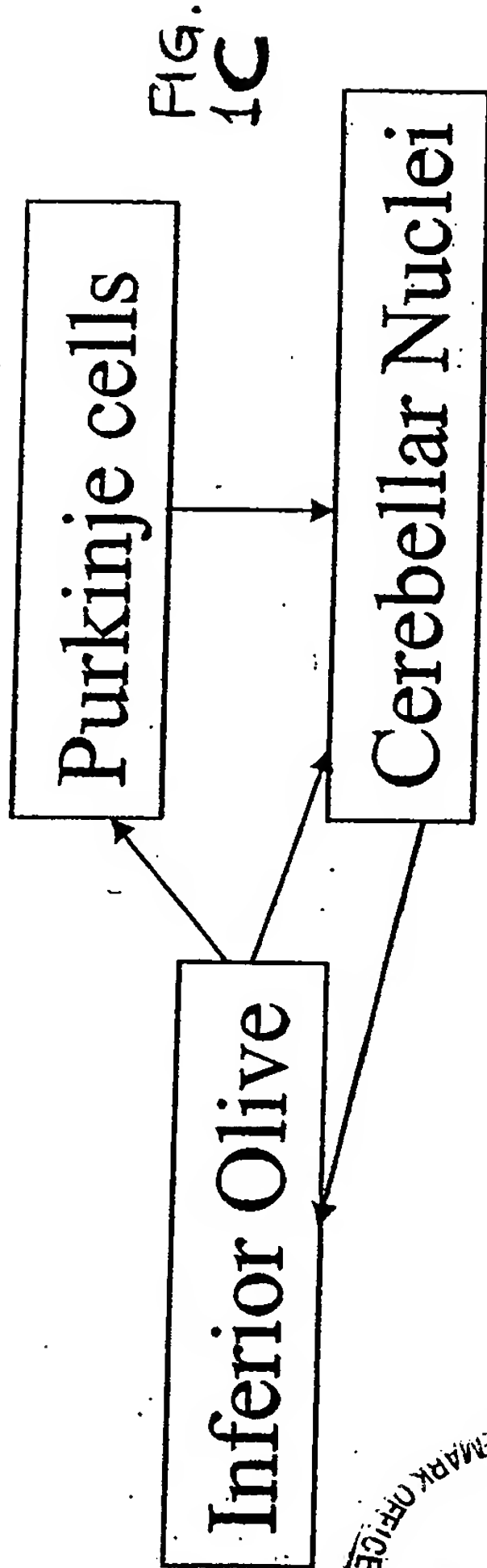


FIG. 1C

ELECTROPHYSIOLOGY OF NEURONES IN OSCILLATION AND RESONANCE 9

FIG. 2A

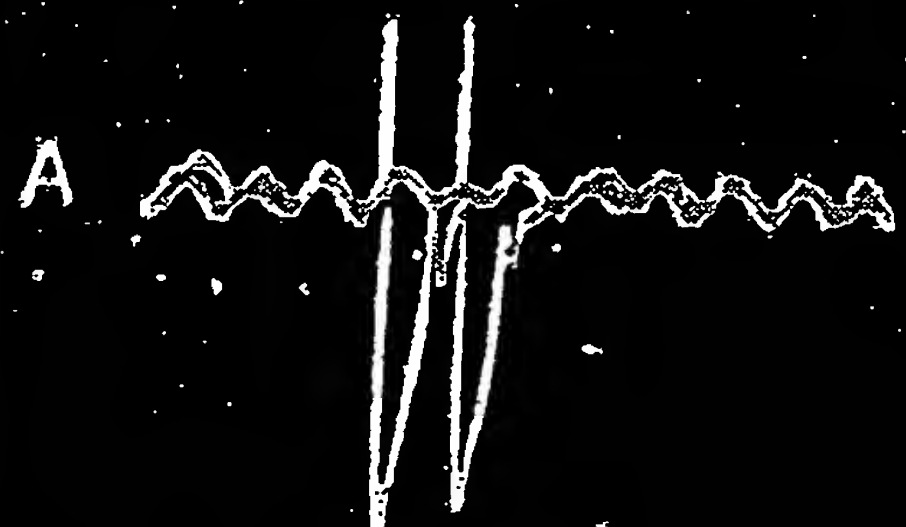


FIG. 2B

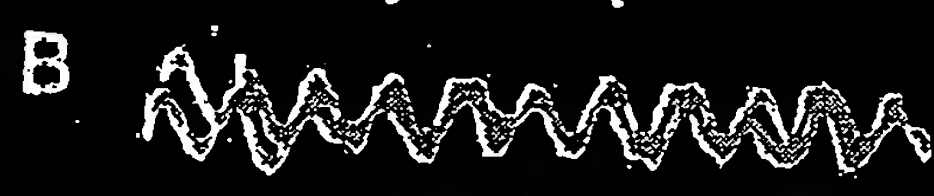
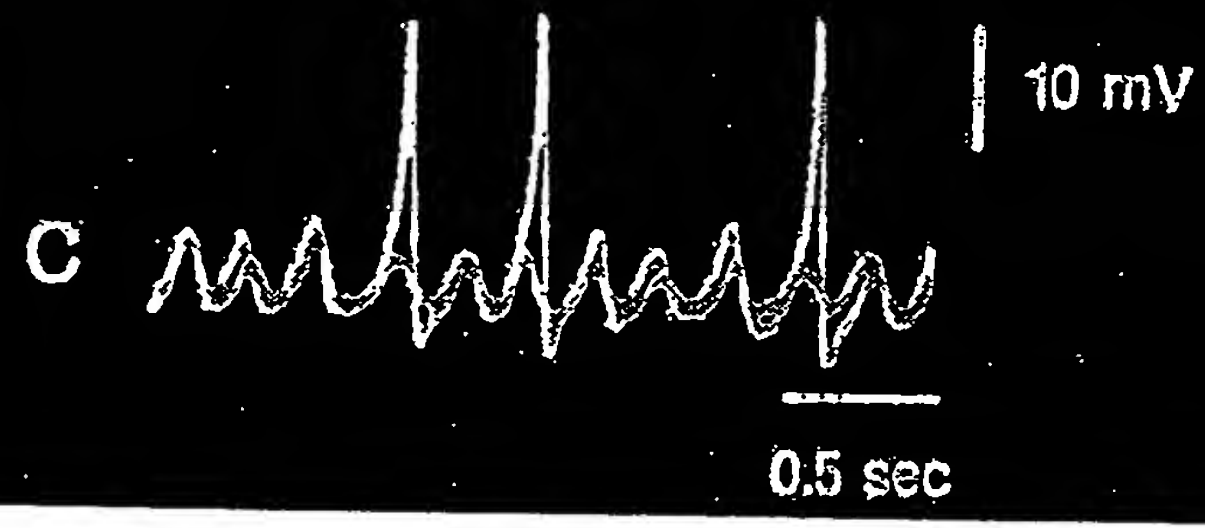


FIG. 2C



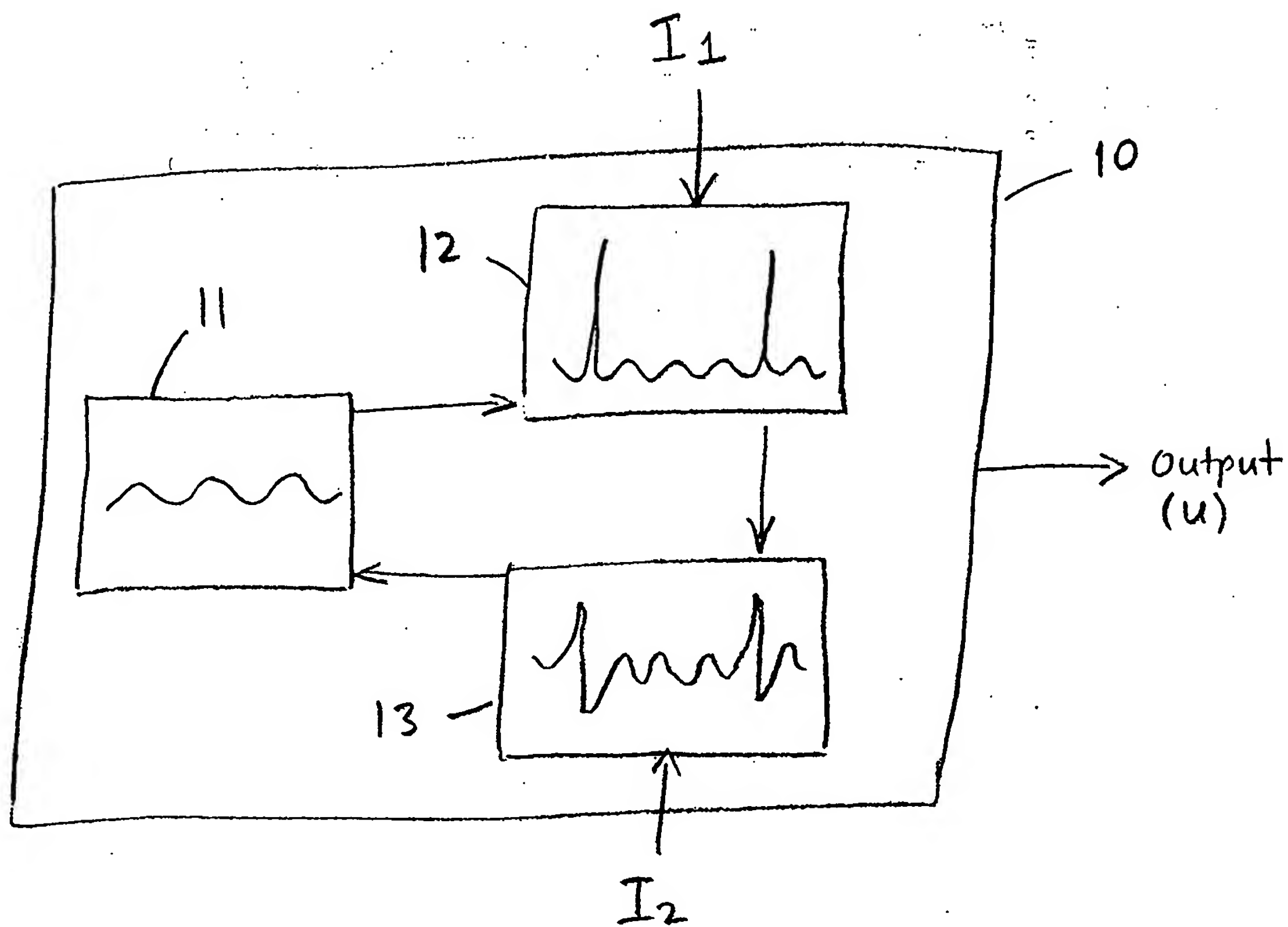


FIG. 3

FIG.  
4A

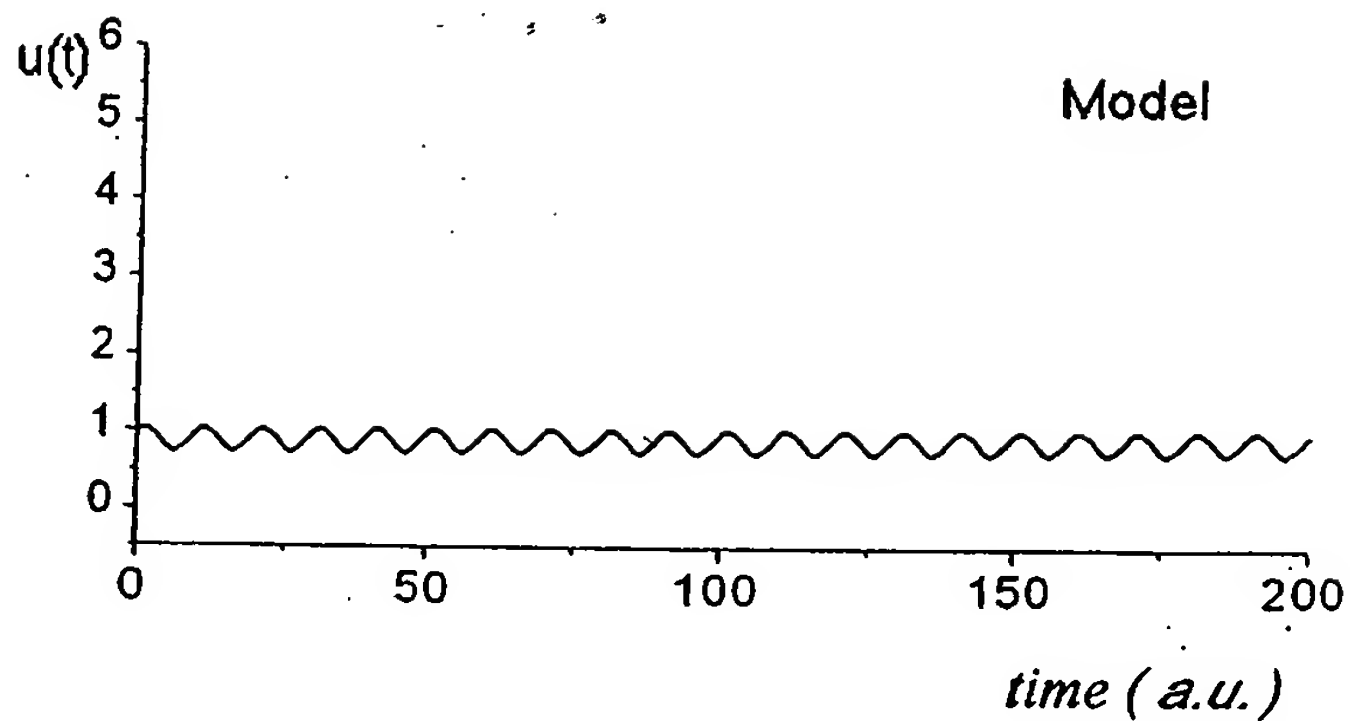


FIG.  
4B

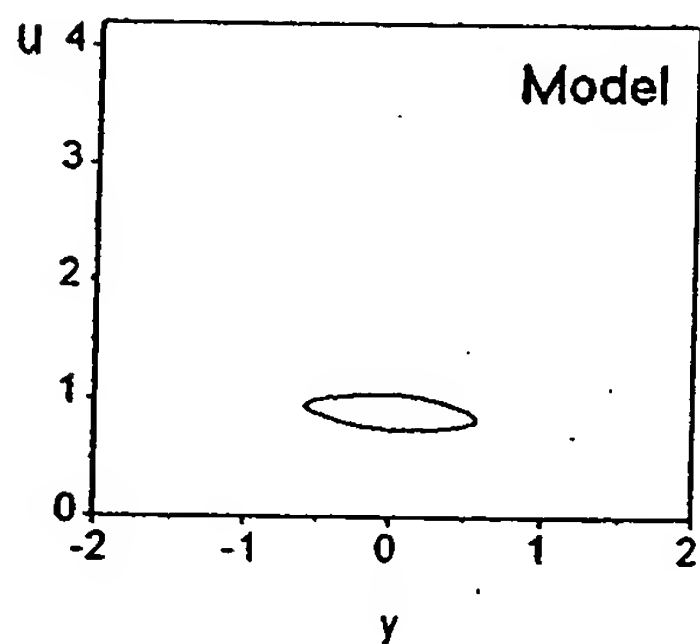


FIG.  
4C

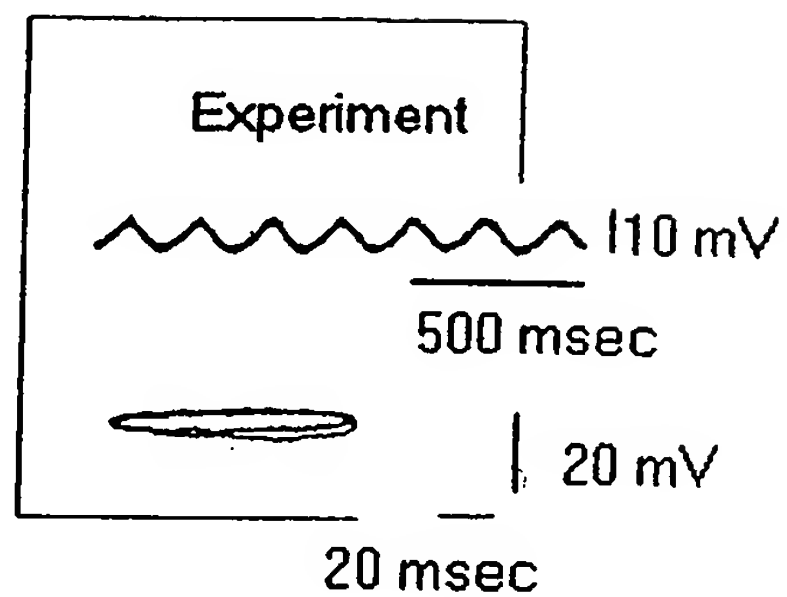


FIG. 5A

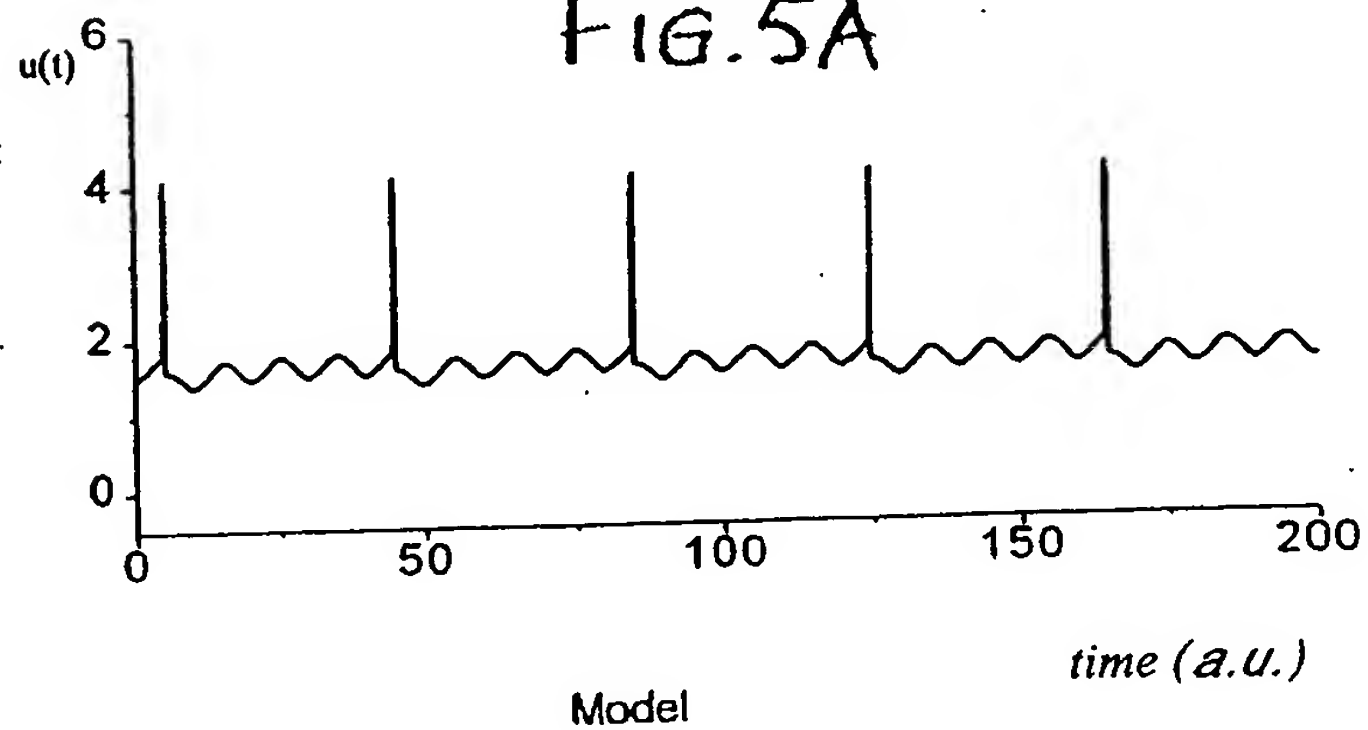
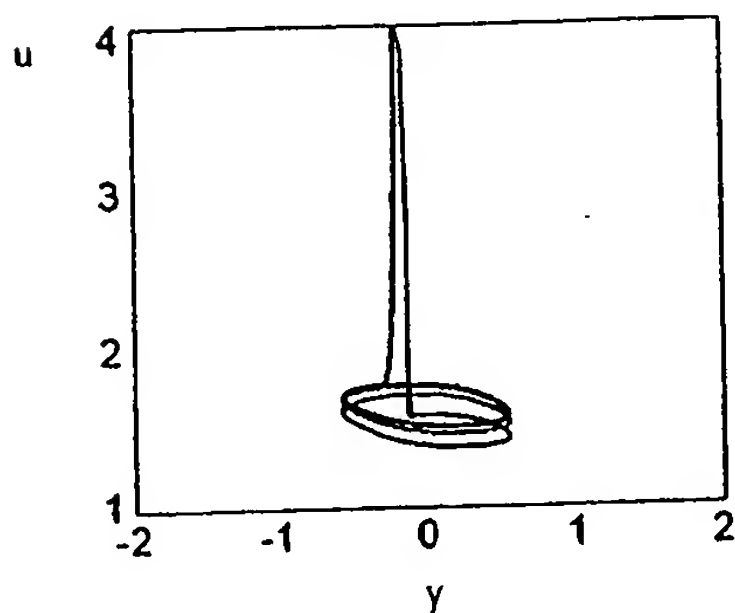
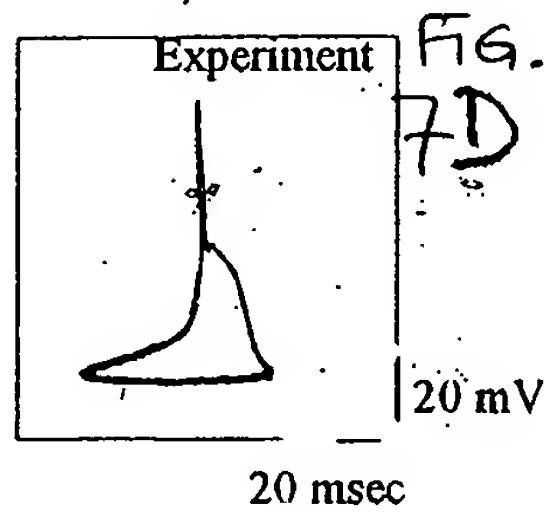
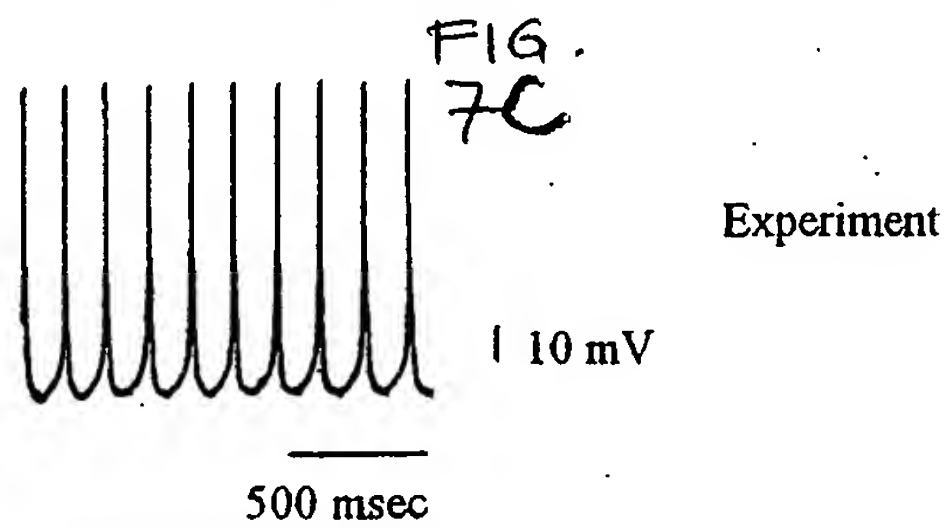
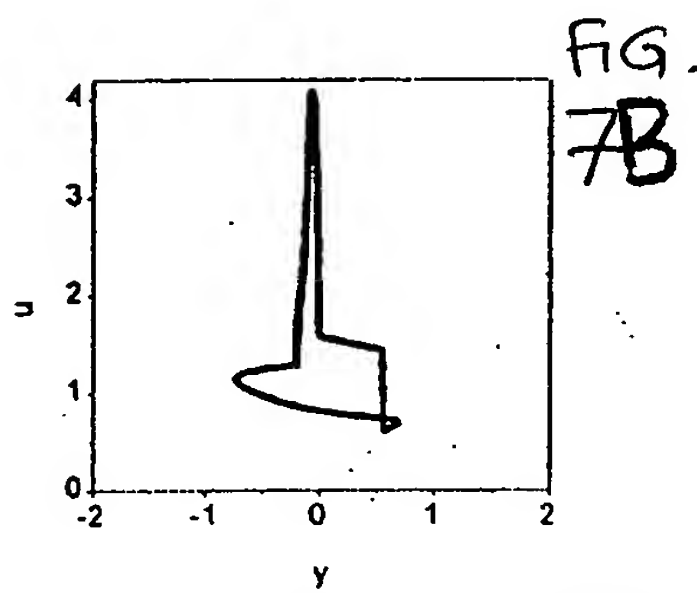
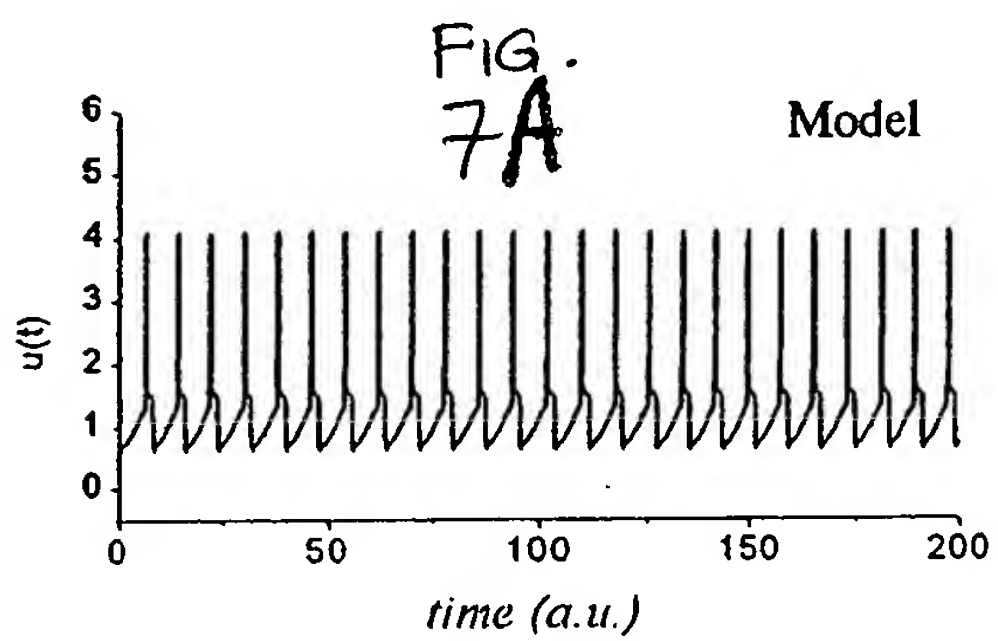
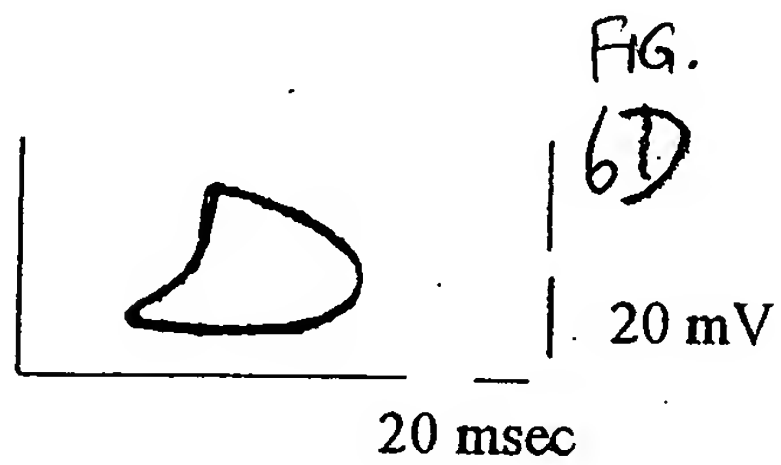
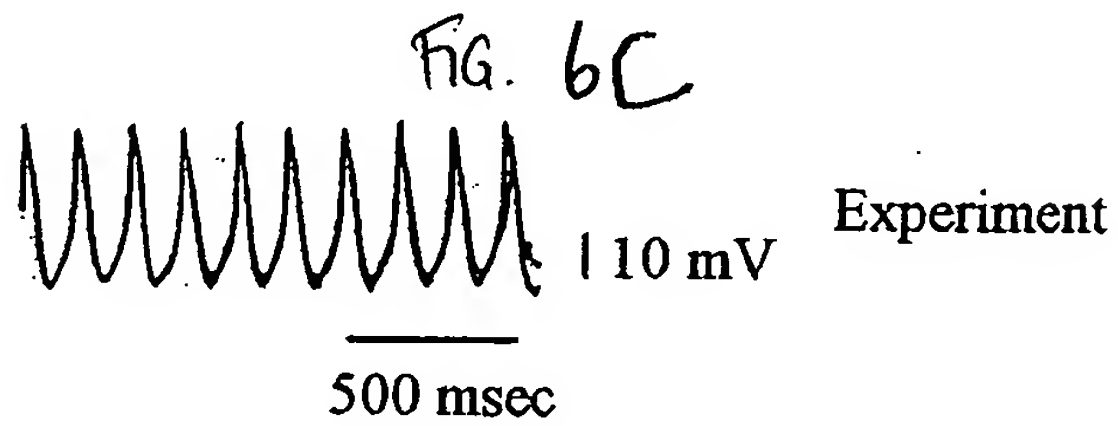
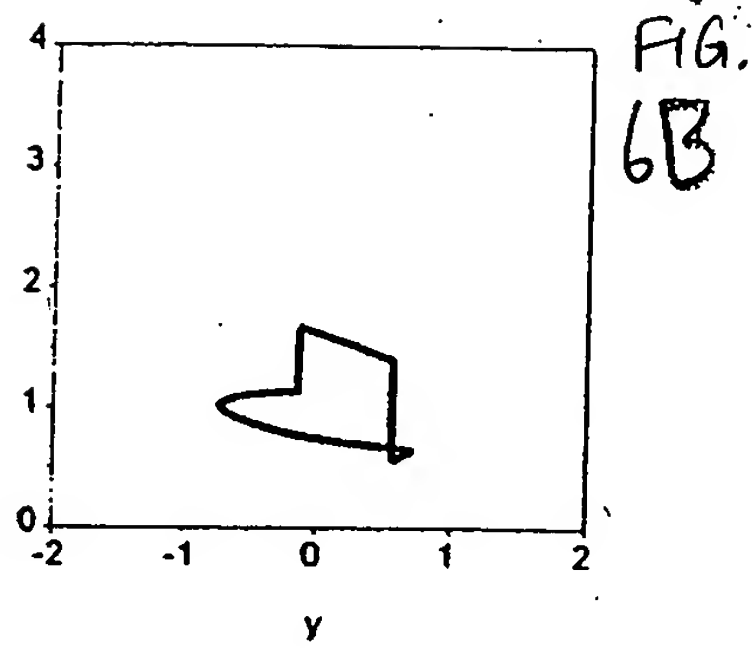
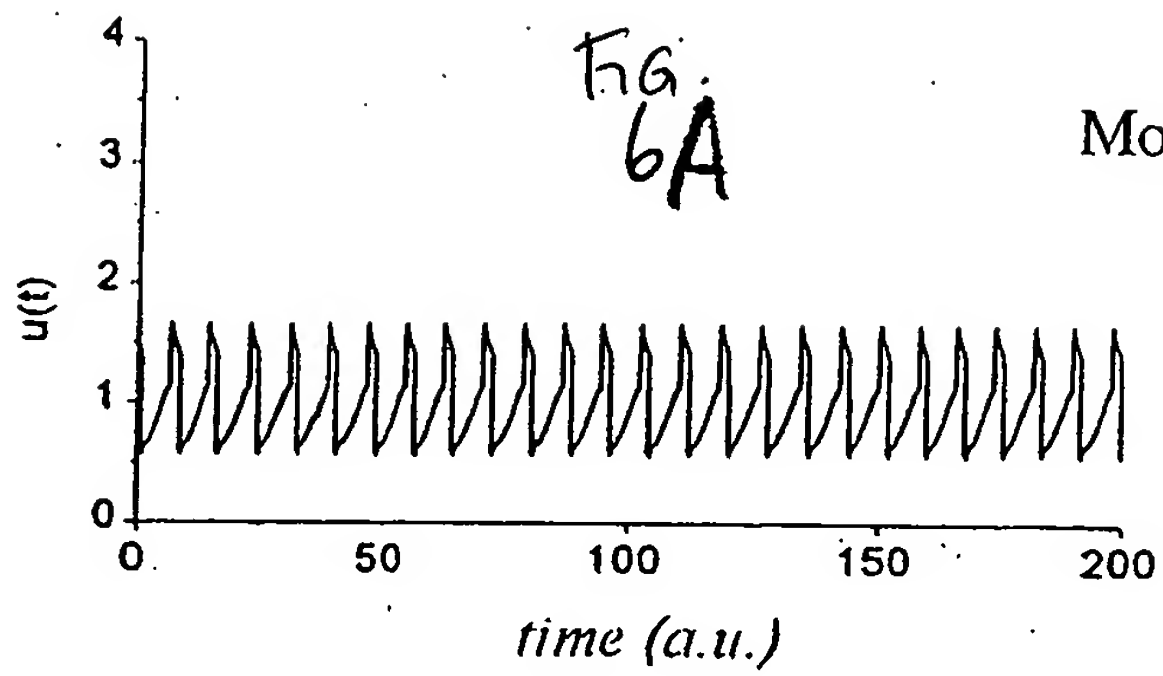


FIG. 5B





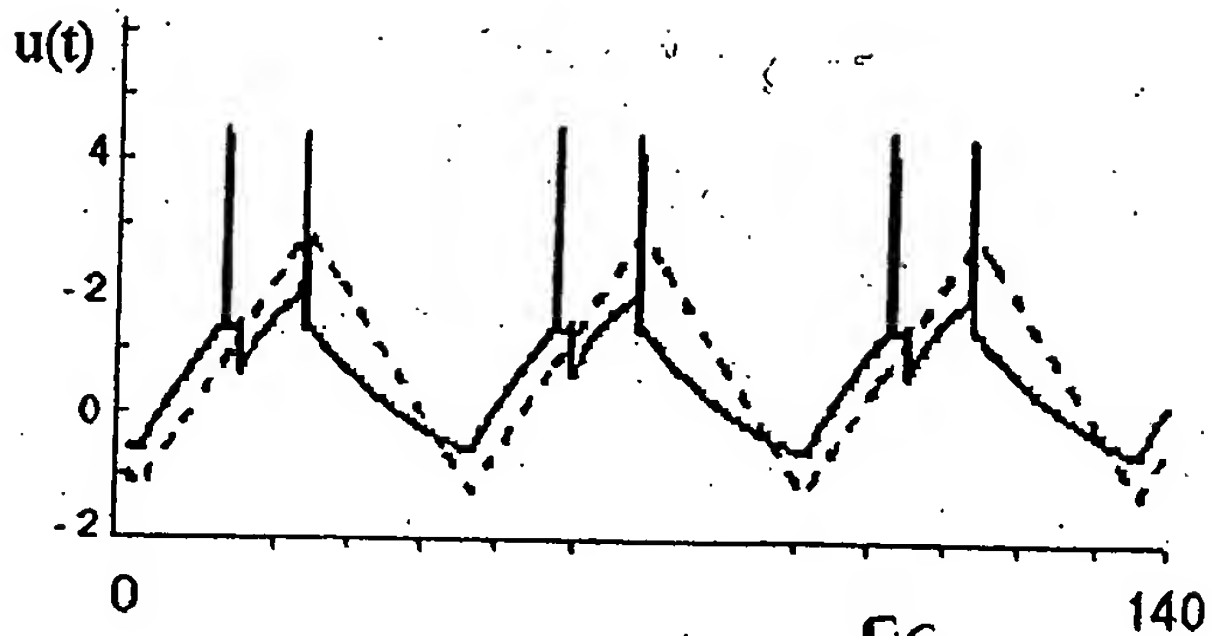


FIG. 8A  
time (a.u.)

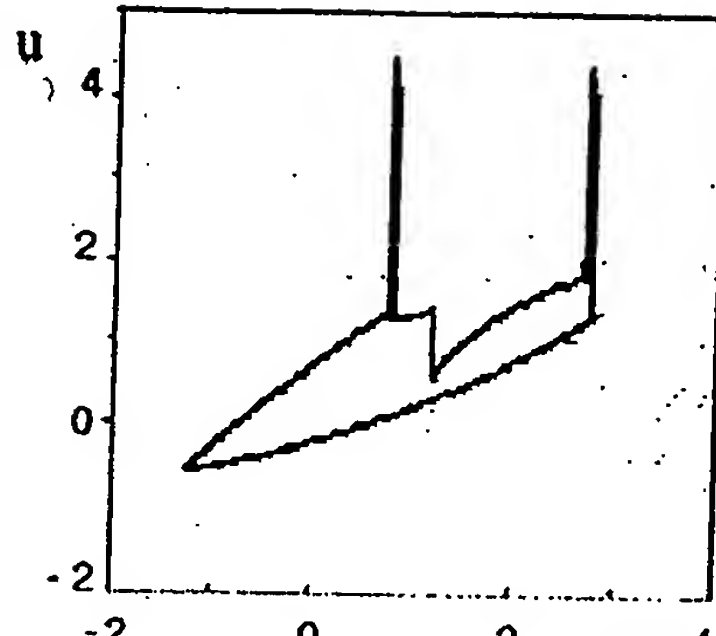


FIG. 8B  
I(t) stimulus

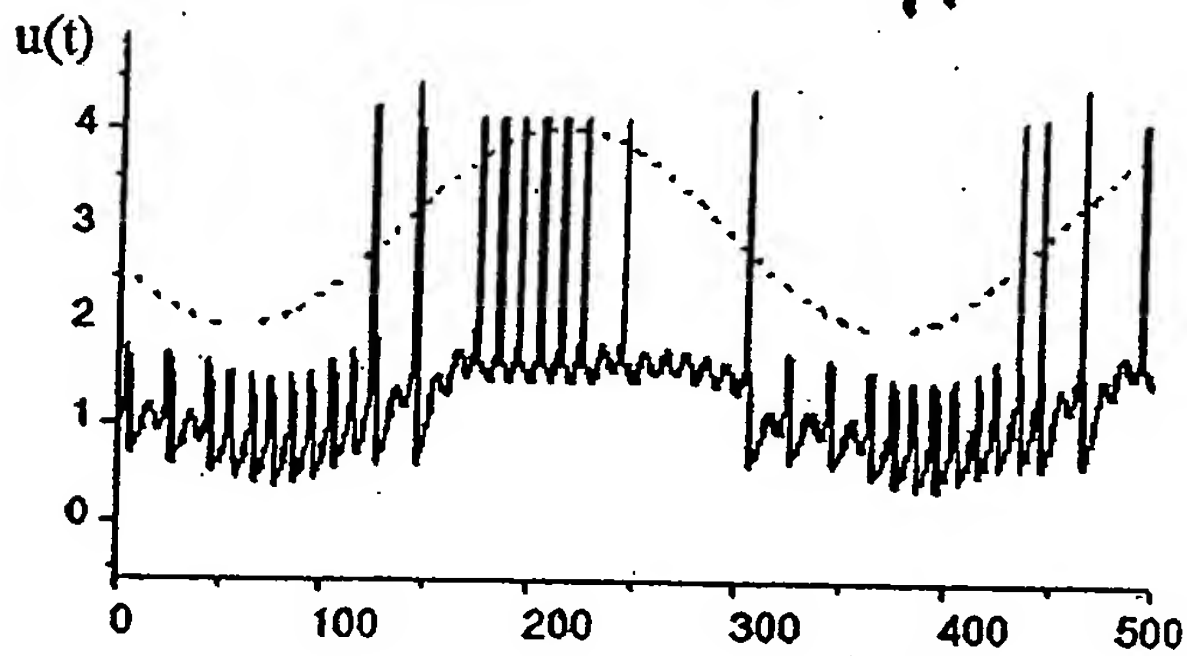


FIG. 8D  
time (msec)

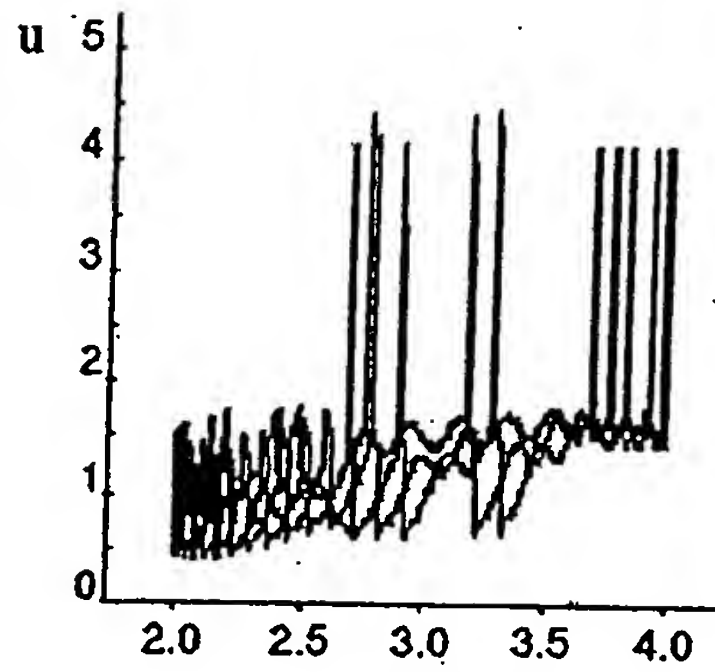


FIG. 8E  
I(t) stimulus

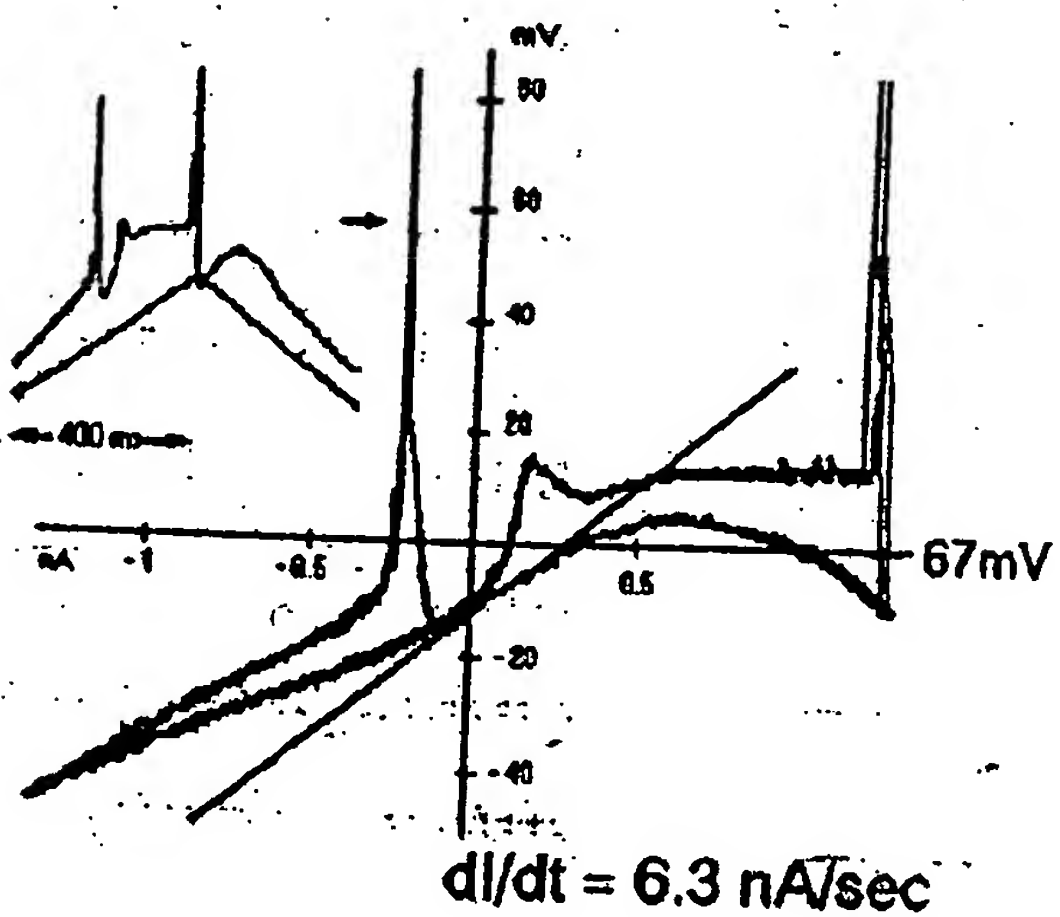
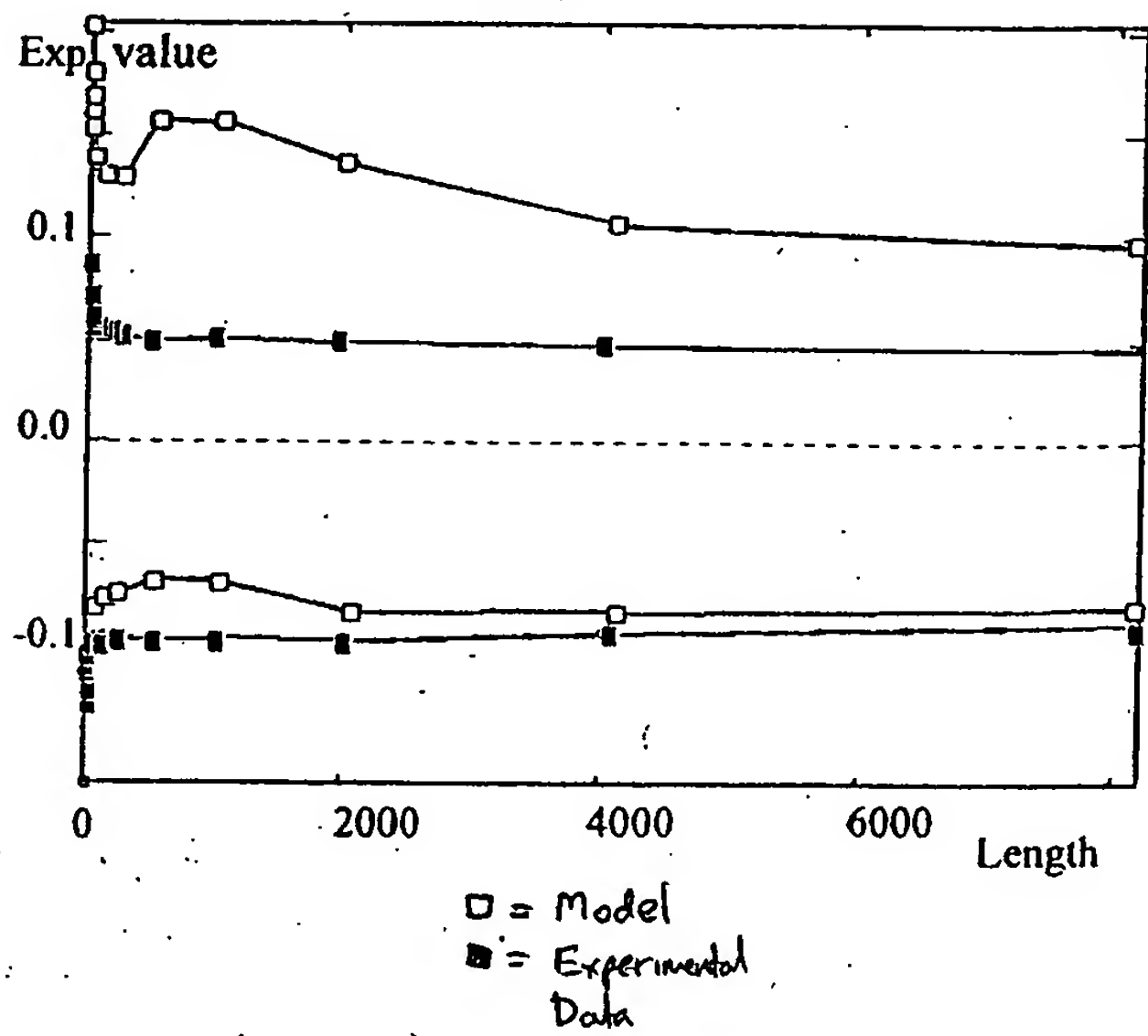


FIG. 8C  
dl/dt = 6.3 nA/sec

FIG. 9



# Block-diagram of the circuit

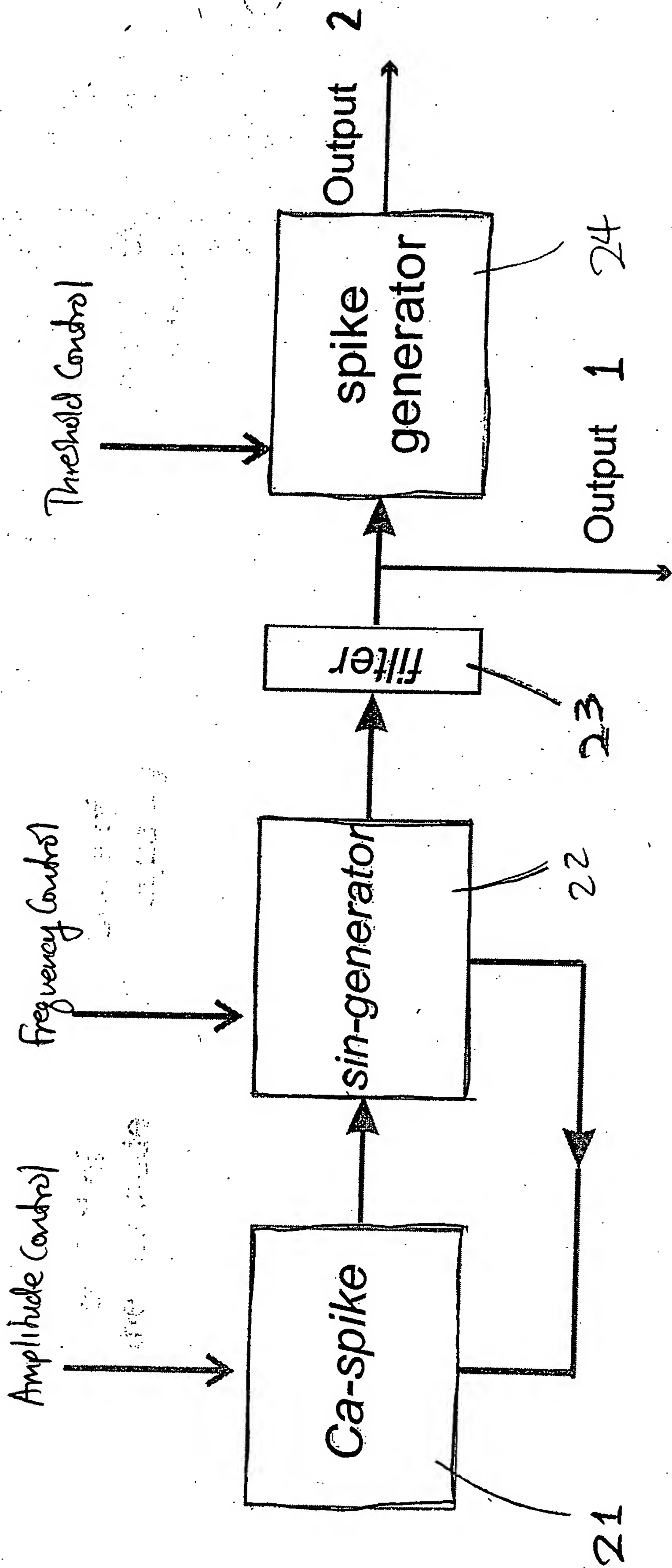


FIG. 10





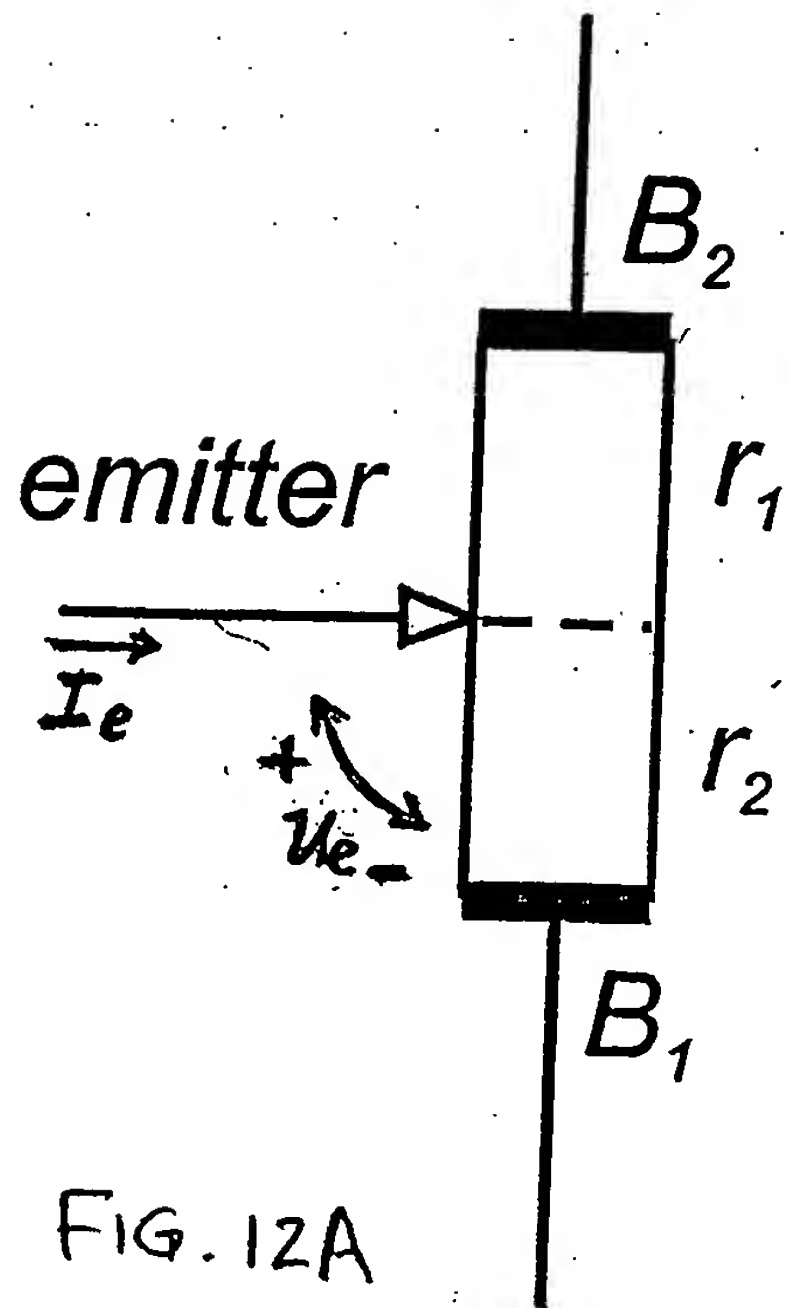


FIG. 12A

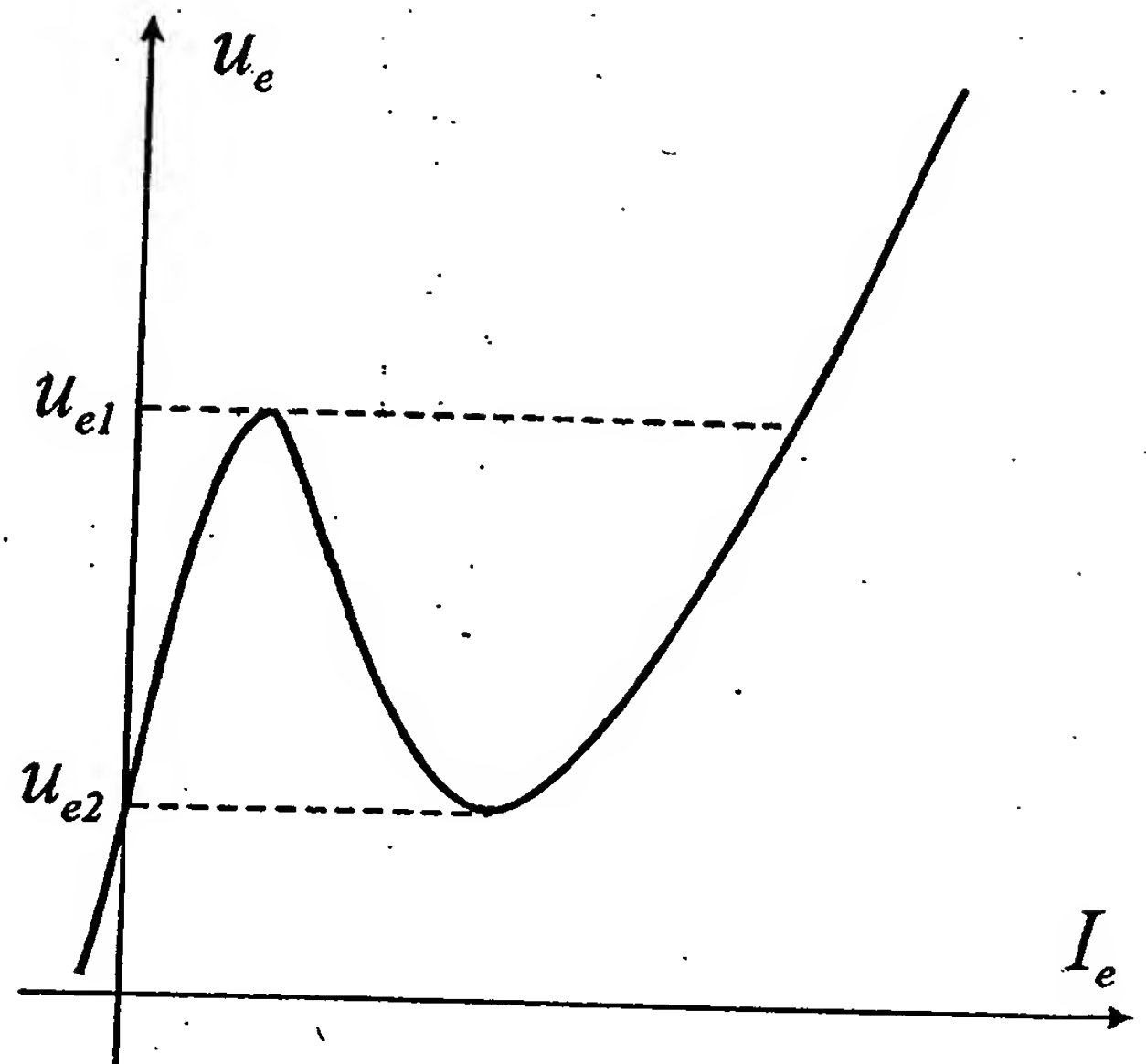


FIG. 12B

# Two chip experiments

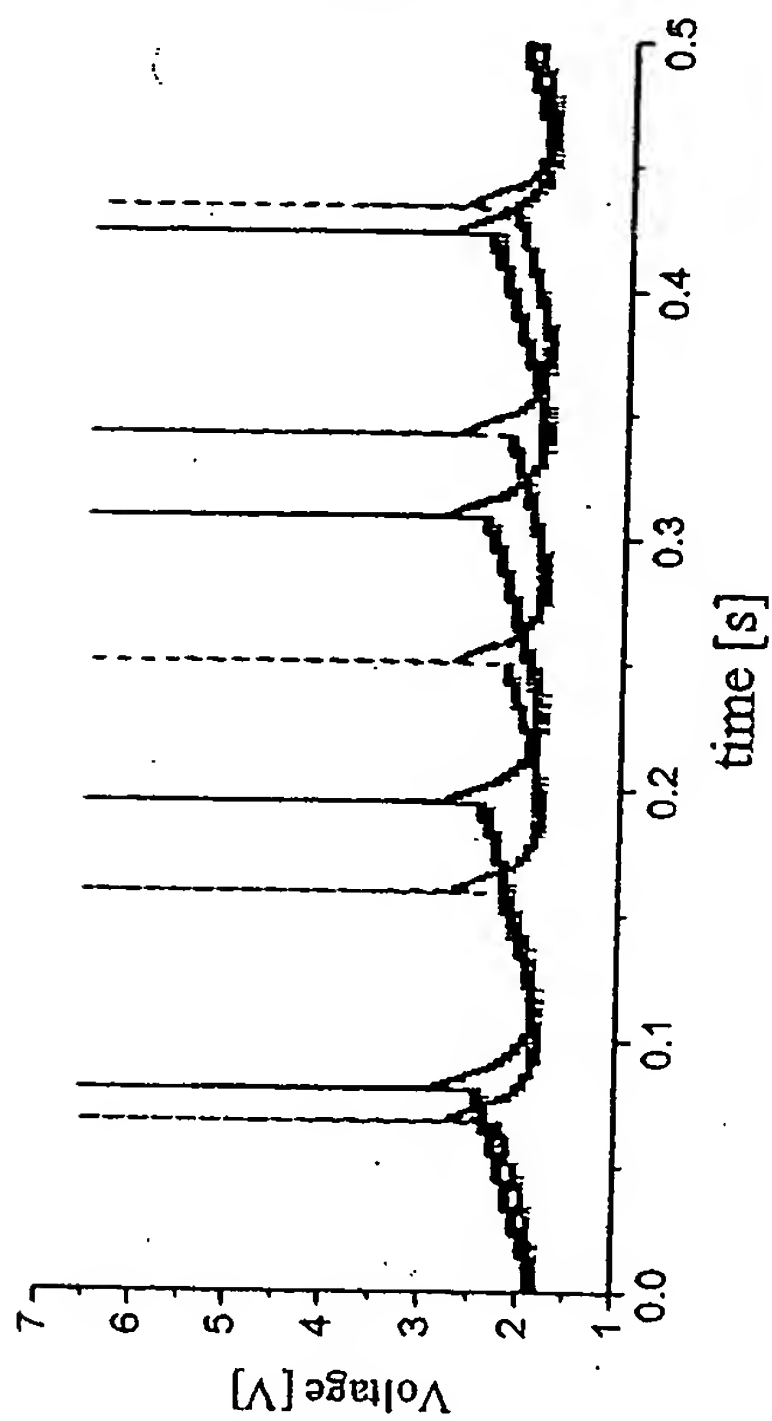
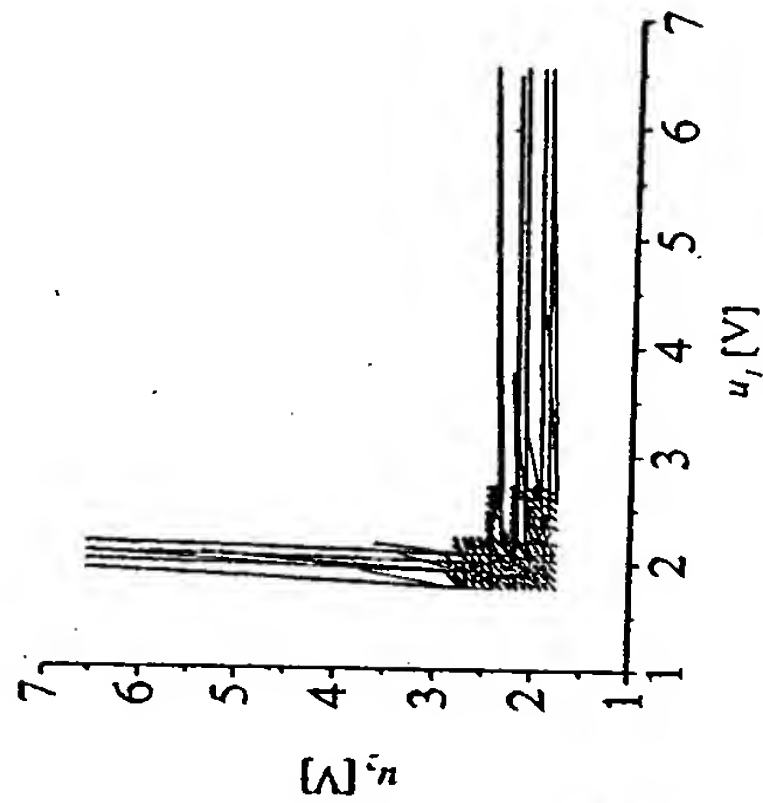


FIG. 13A



Uncoupled cells

FIG. 13B

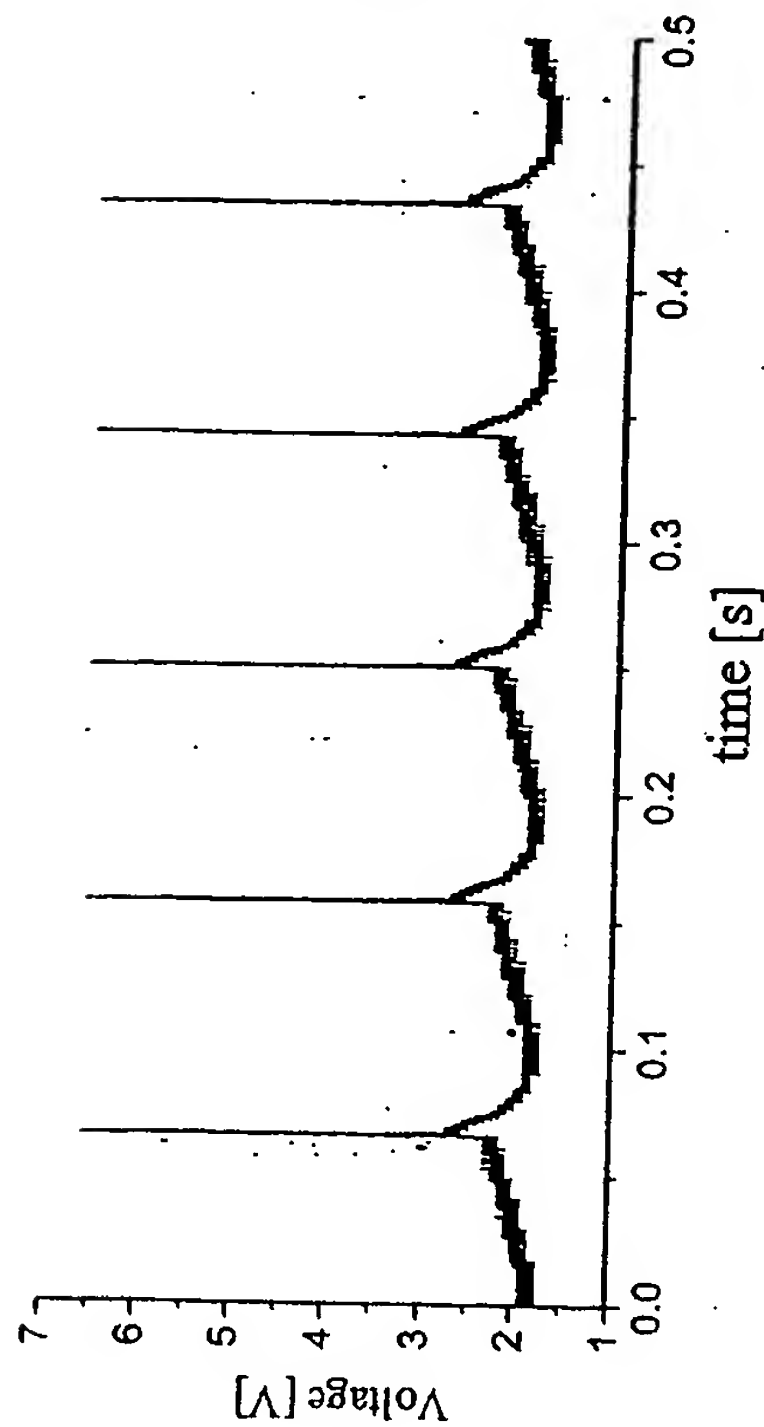
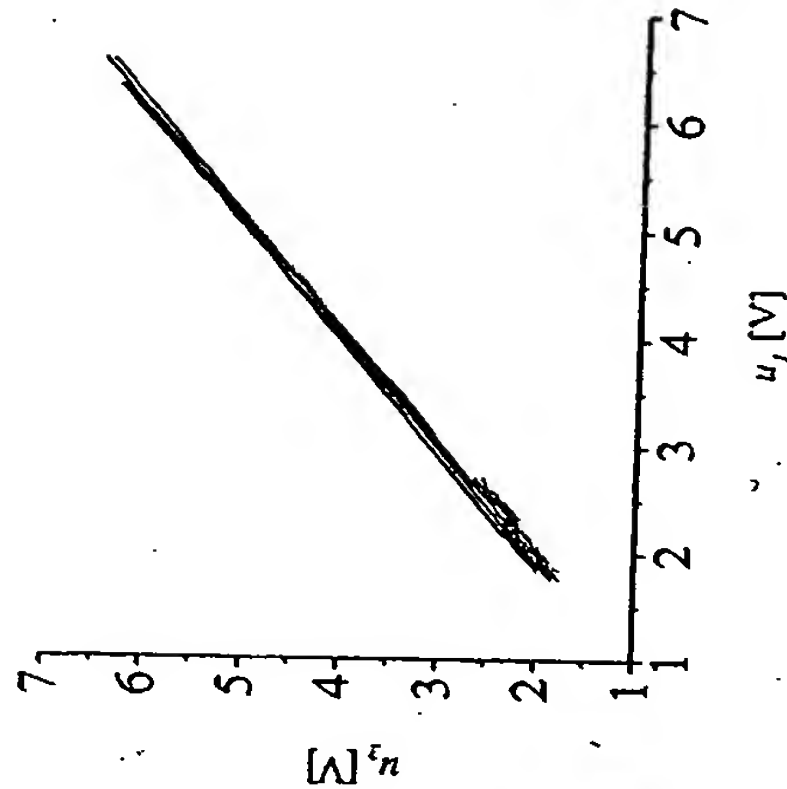


FIG. 13C



Synchronization

FIG. 13D

# Synchronous and asynchronous spiking

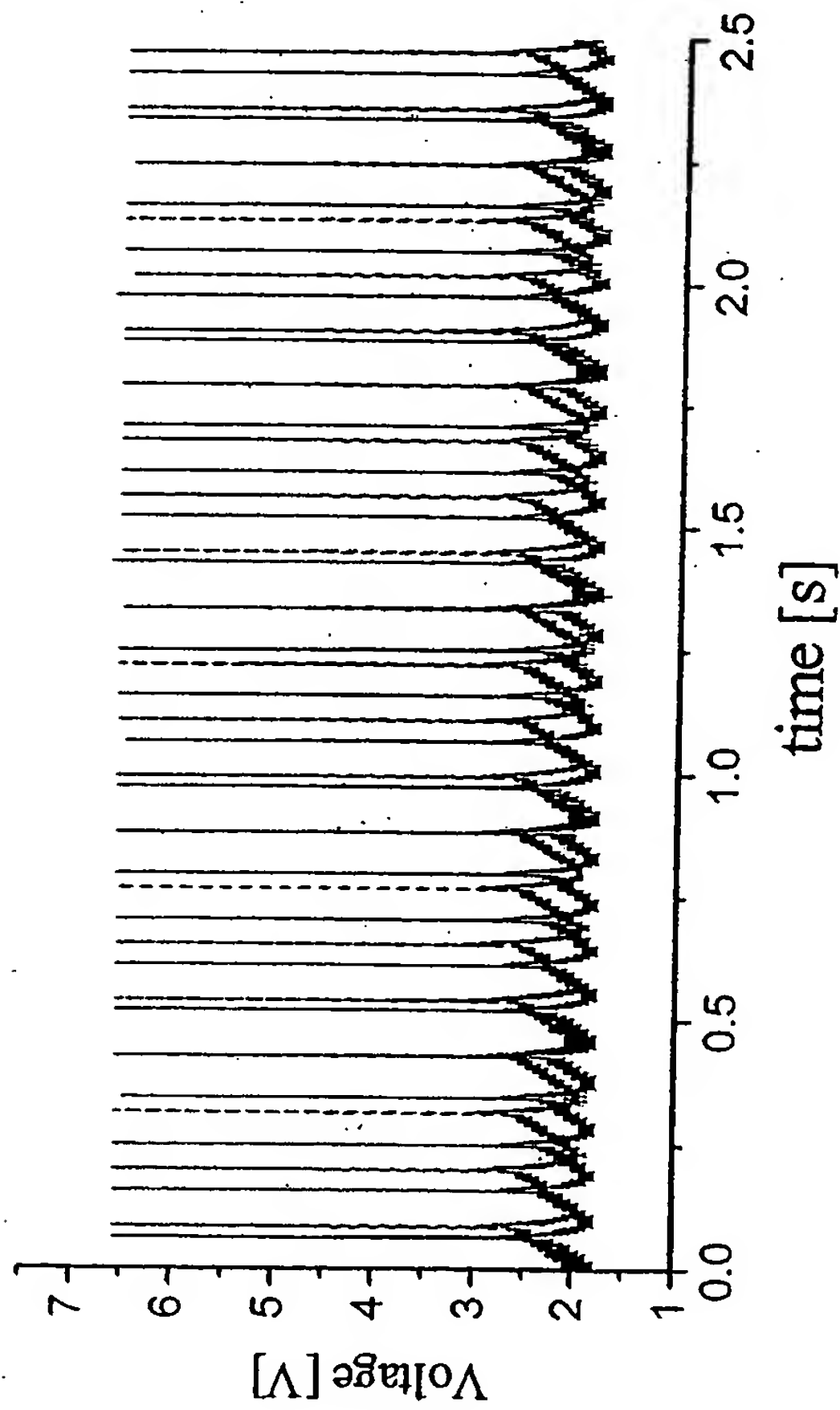


FIG. 14A

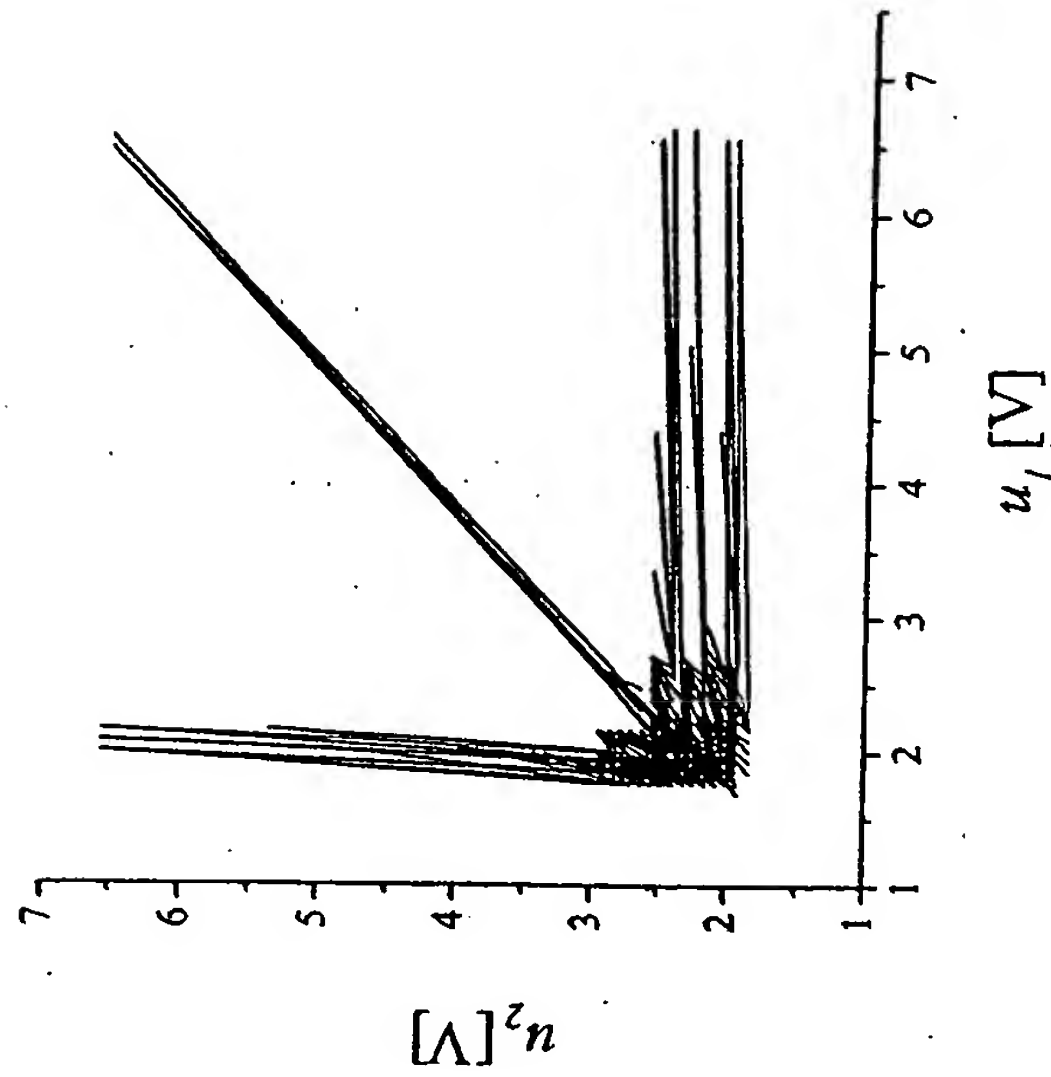
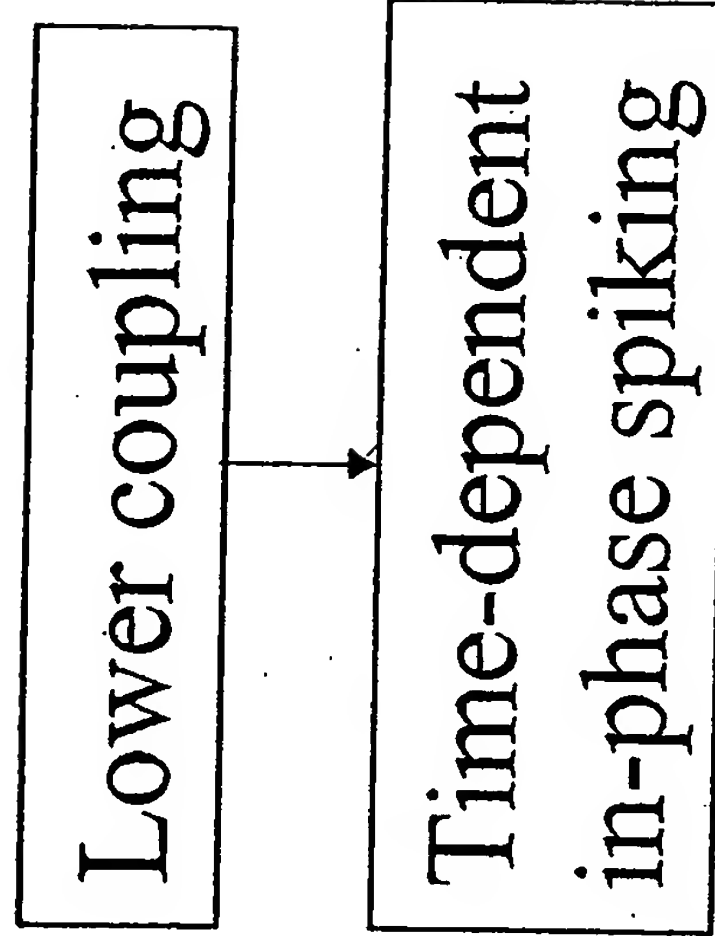


FIG. 14B



1000

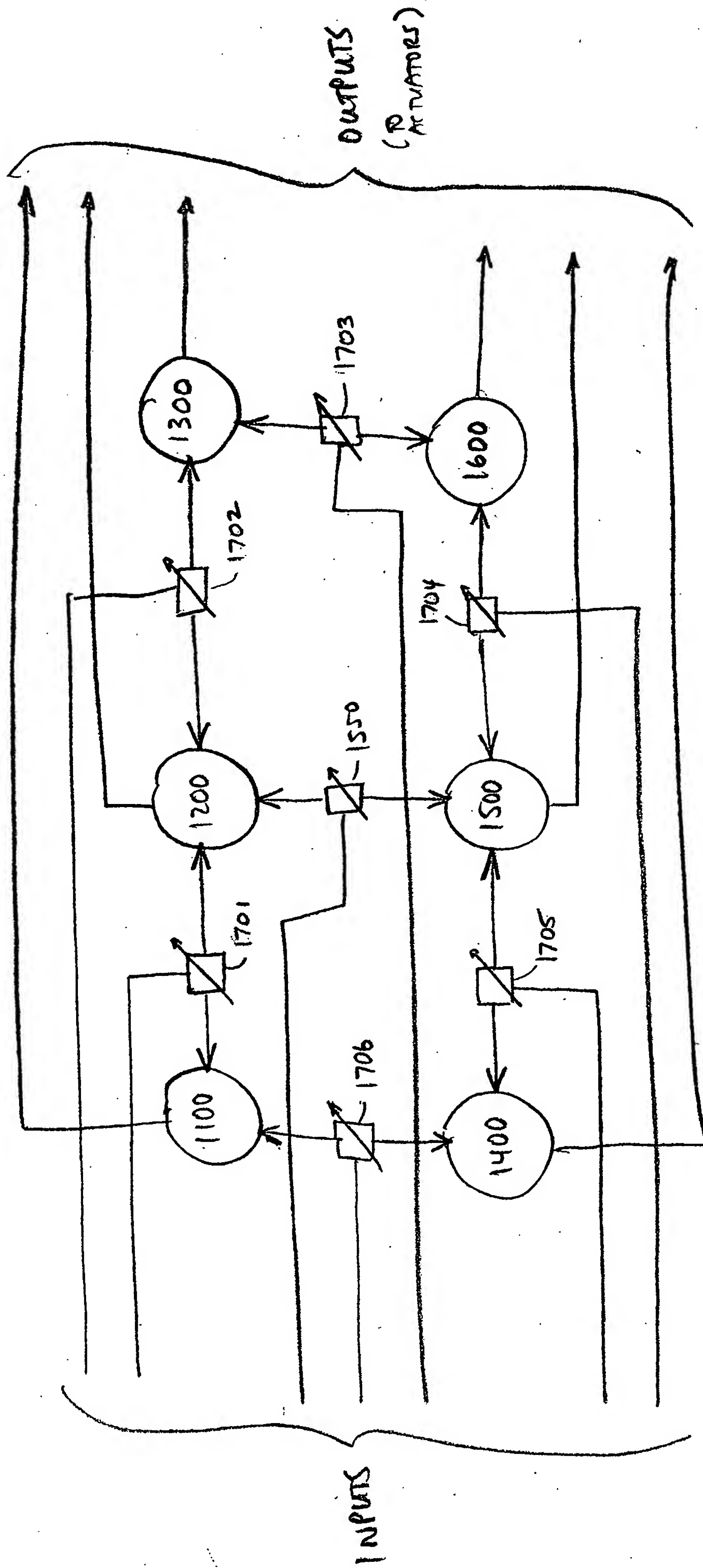


Fig. 15



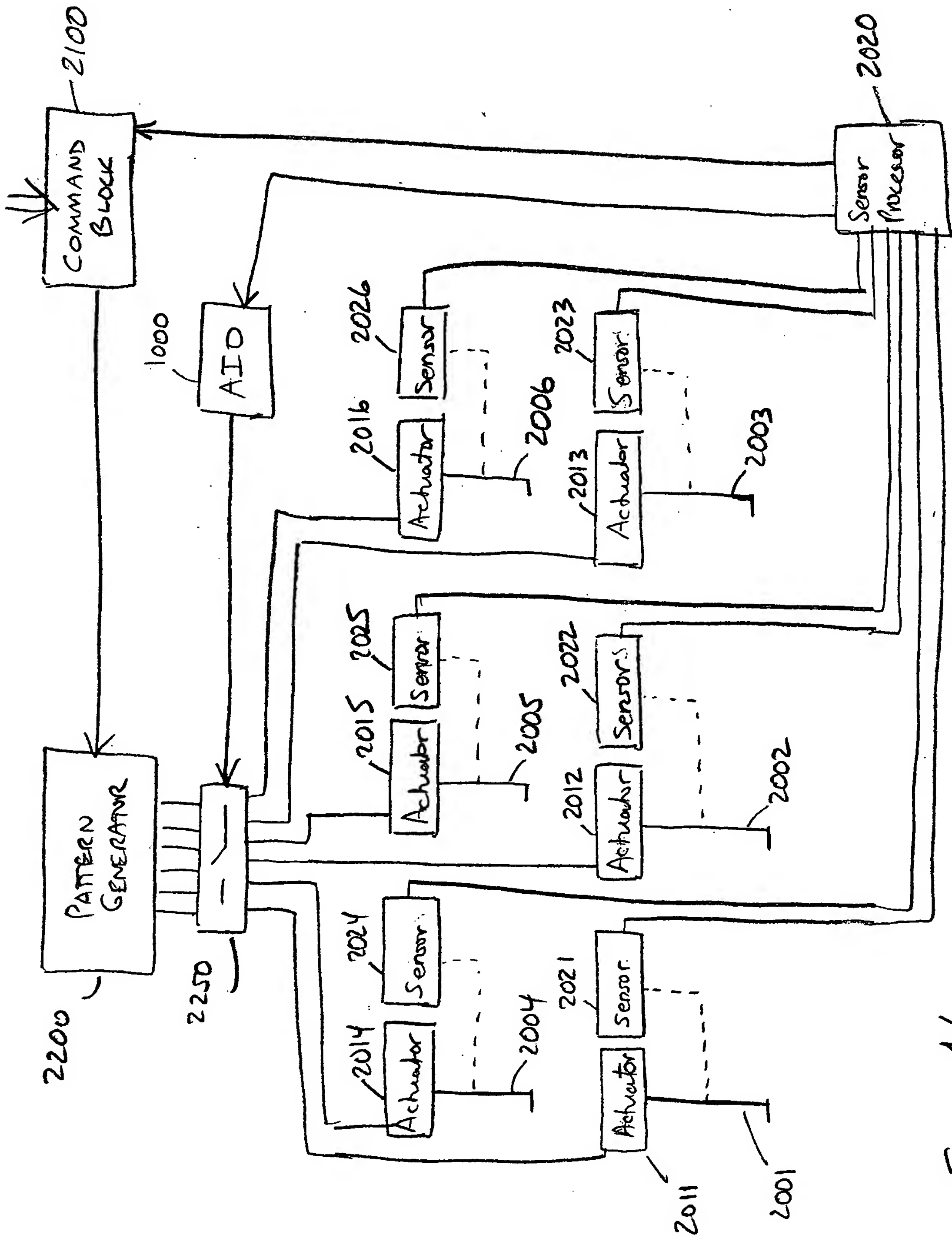


FIG. 16

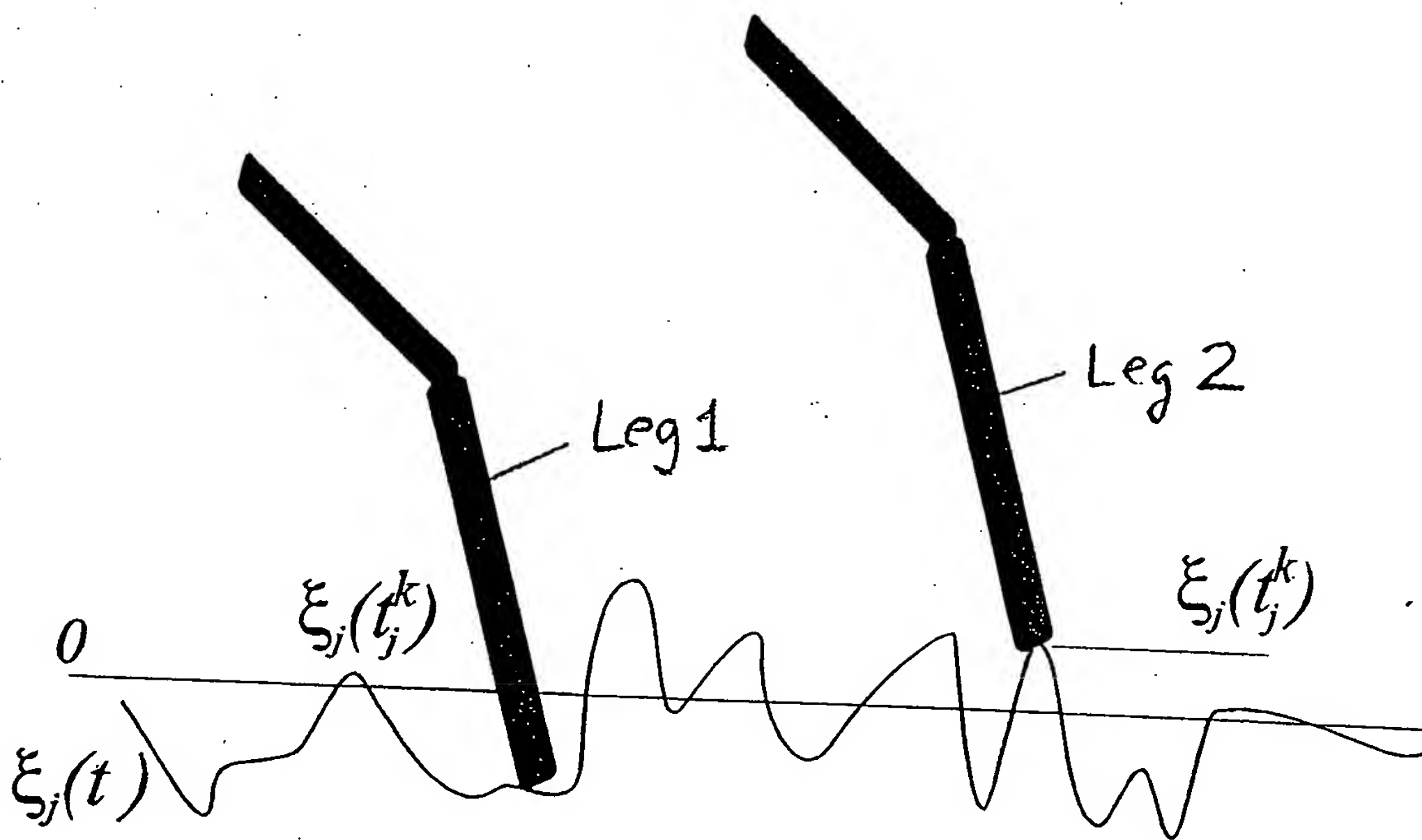
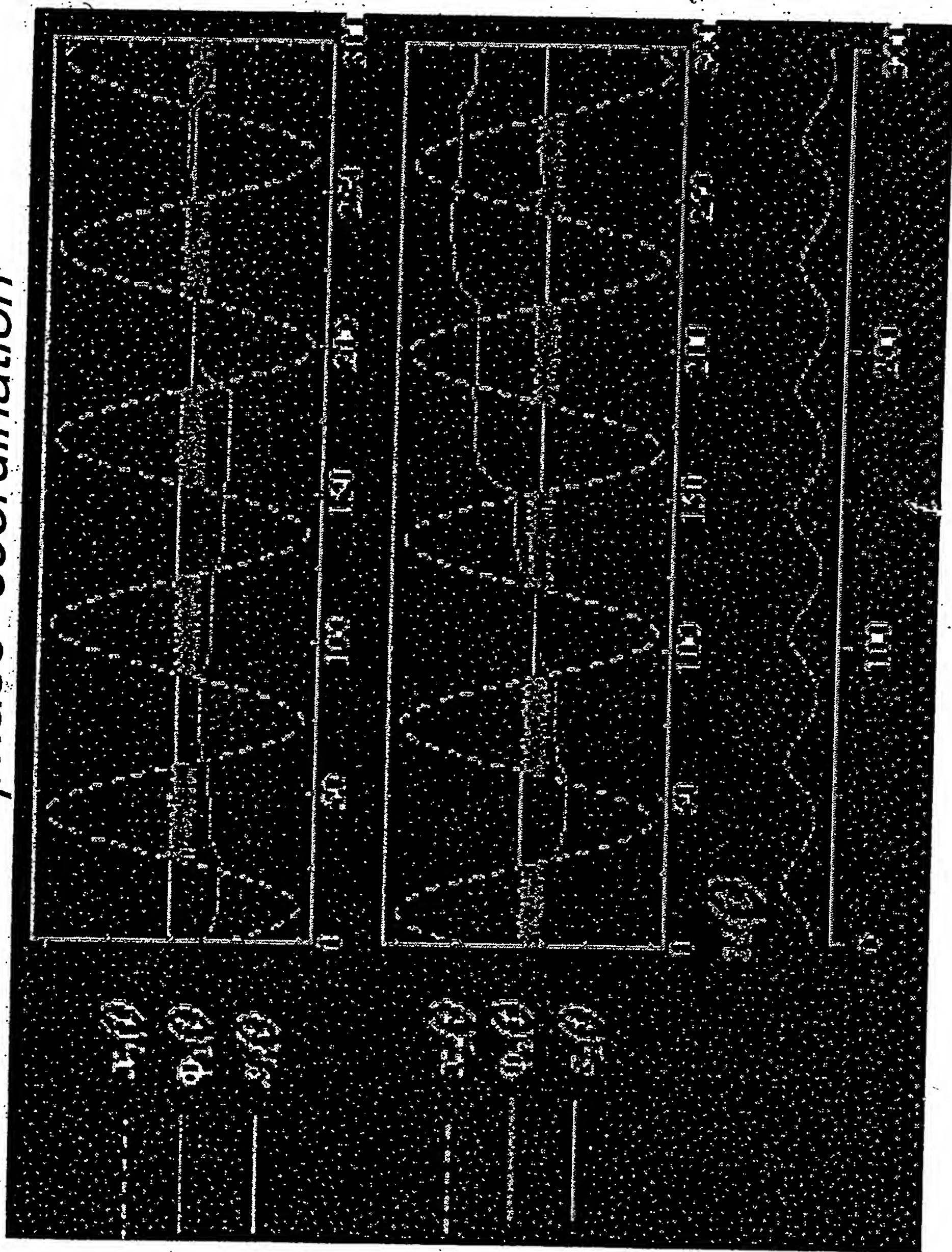


FIG. 17

# *Global phase coordination*



No control



# Coordination with discrete control

FIG.  
19A

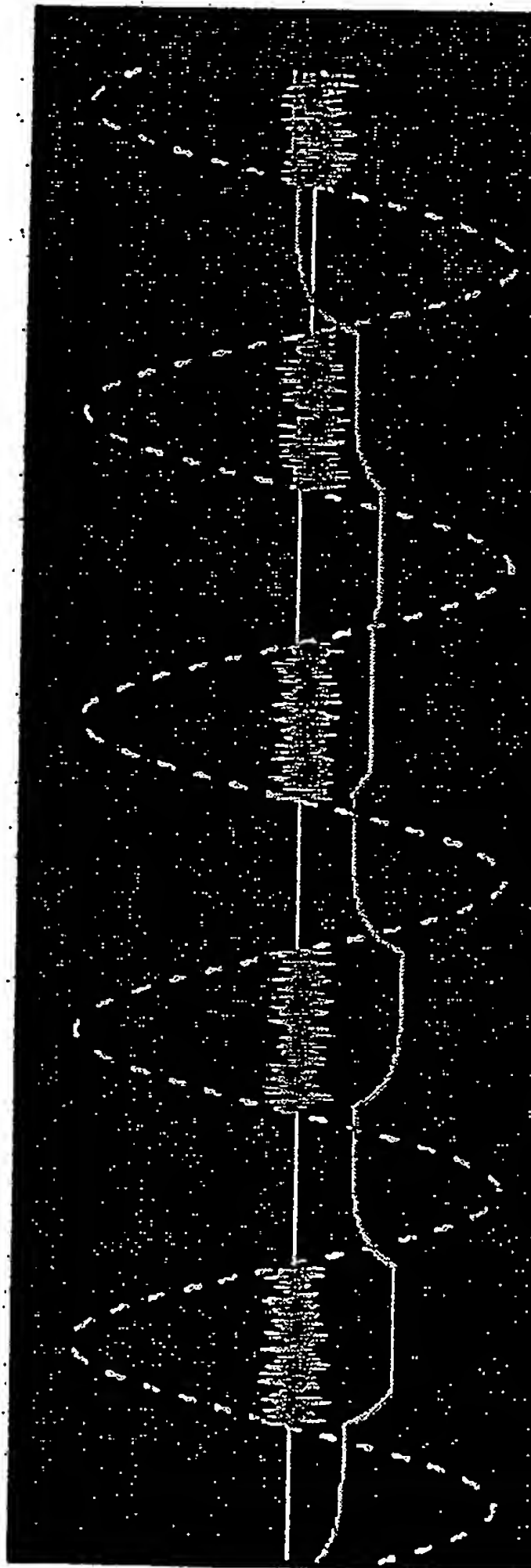


FIG.  
19B

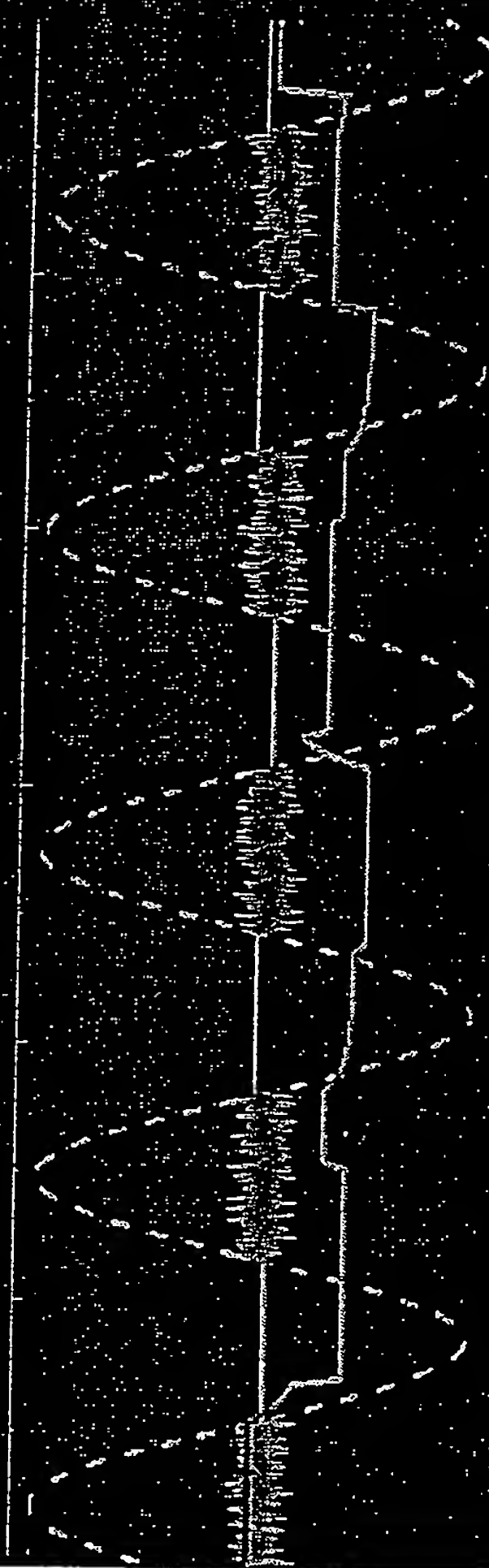
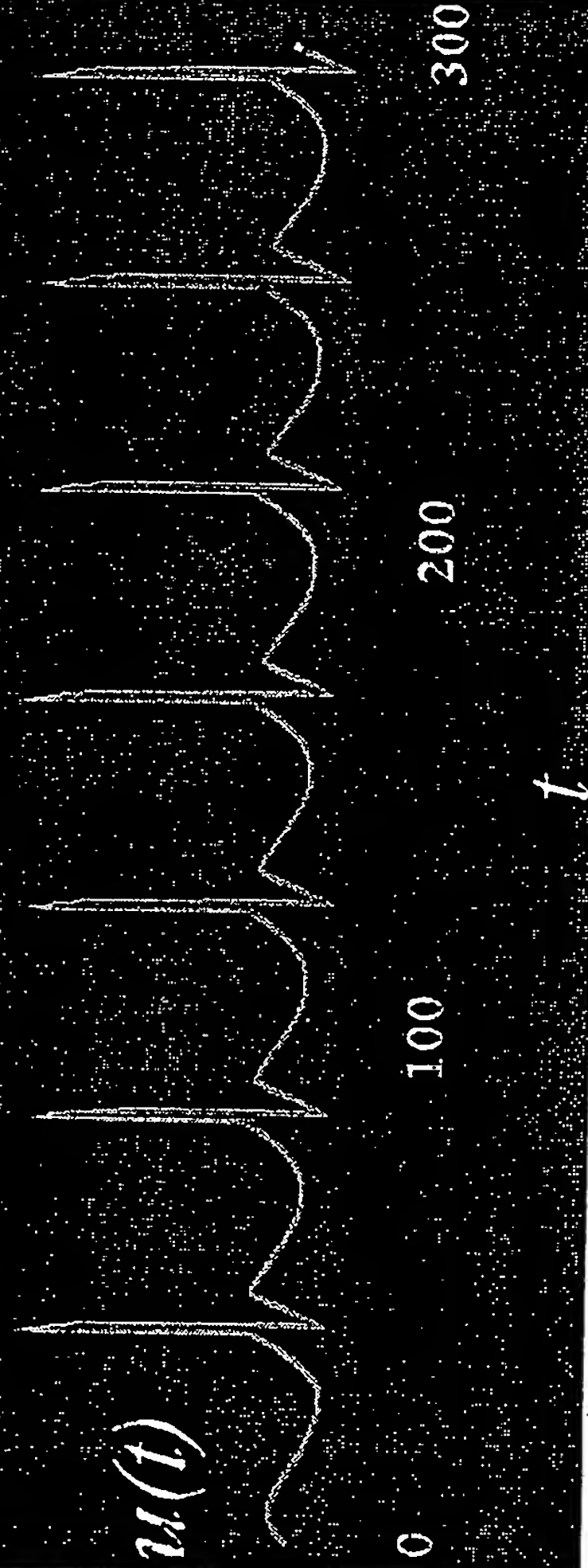
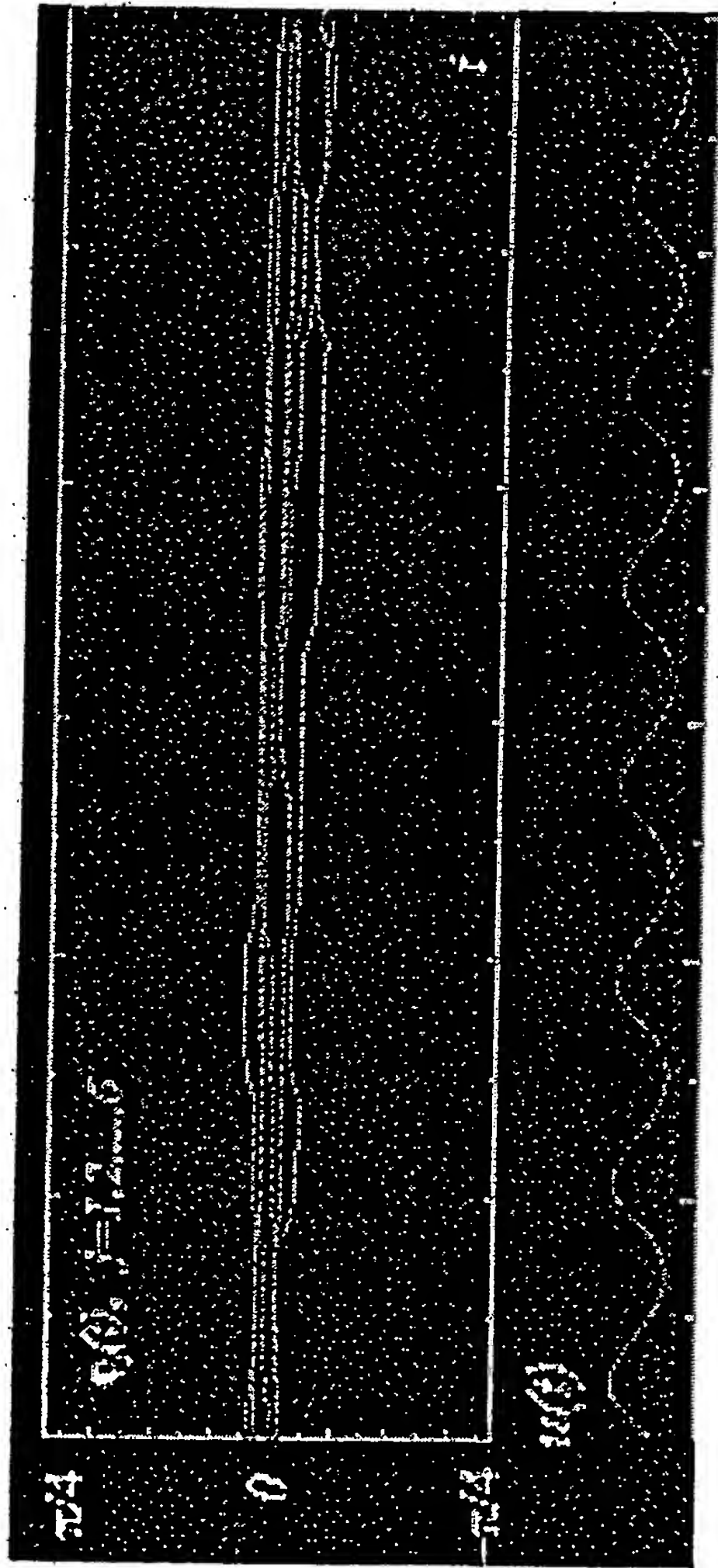


FIG.  
19C

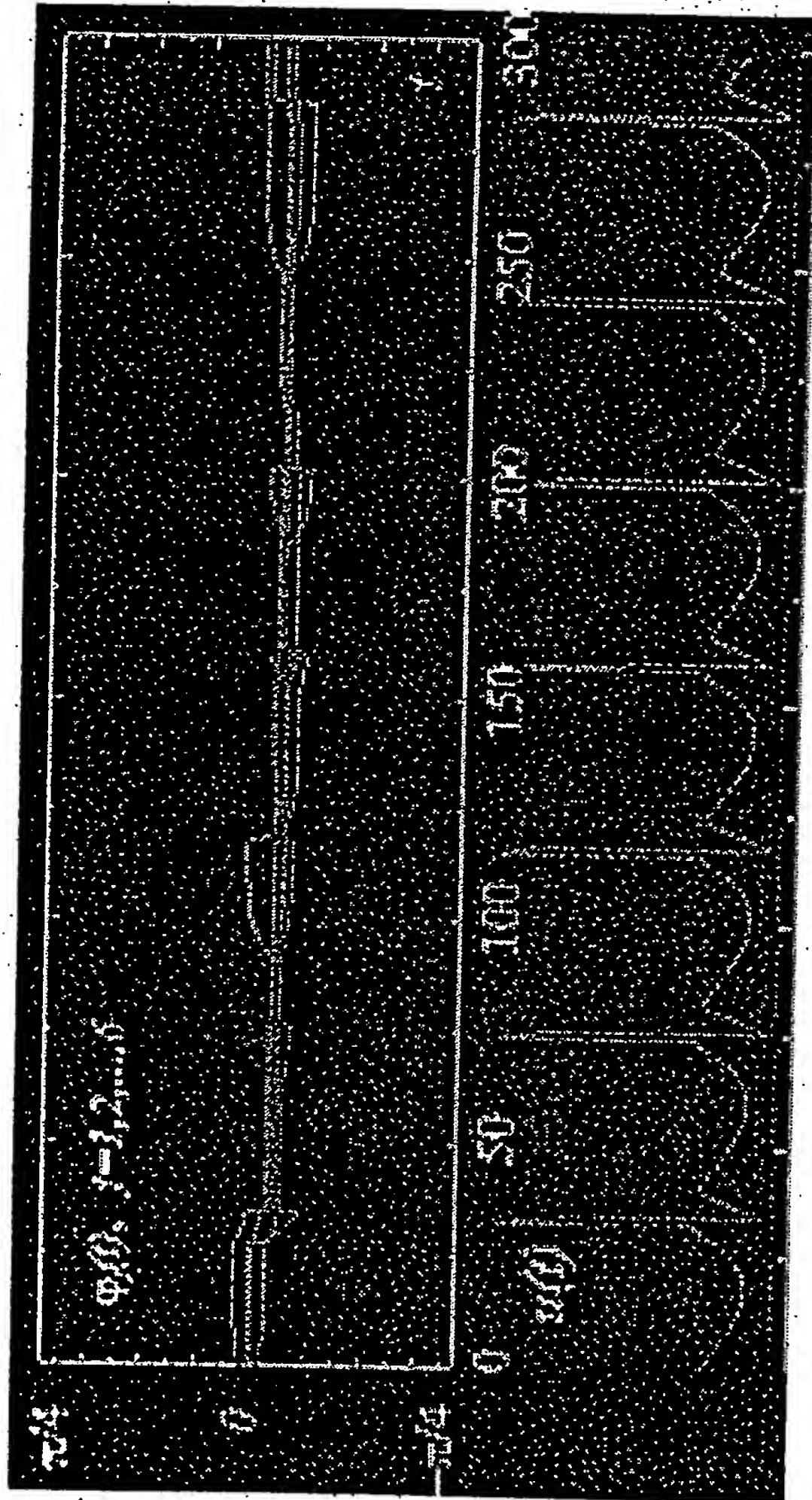


The control signal recovers  
the correct phase shift  
relations

## Evolution of phases



No control – phases evolve according to self-tuning mechanisms



Discrete control – the movement is controlled to sustain the walking gate

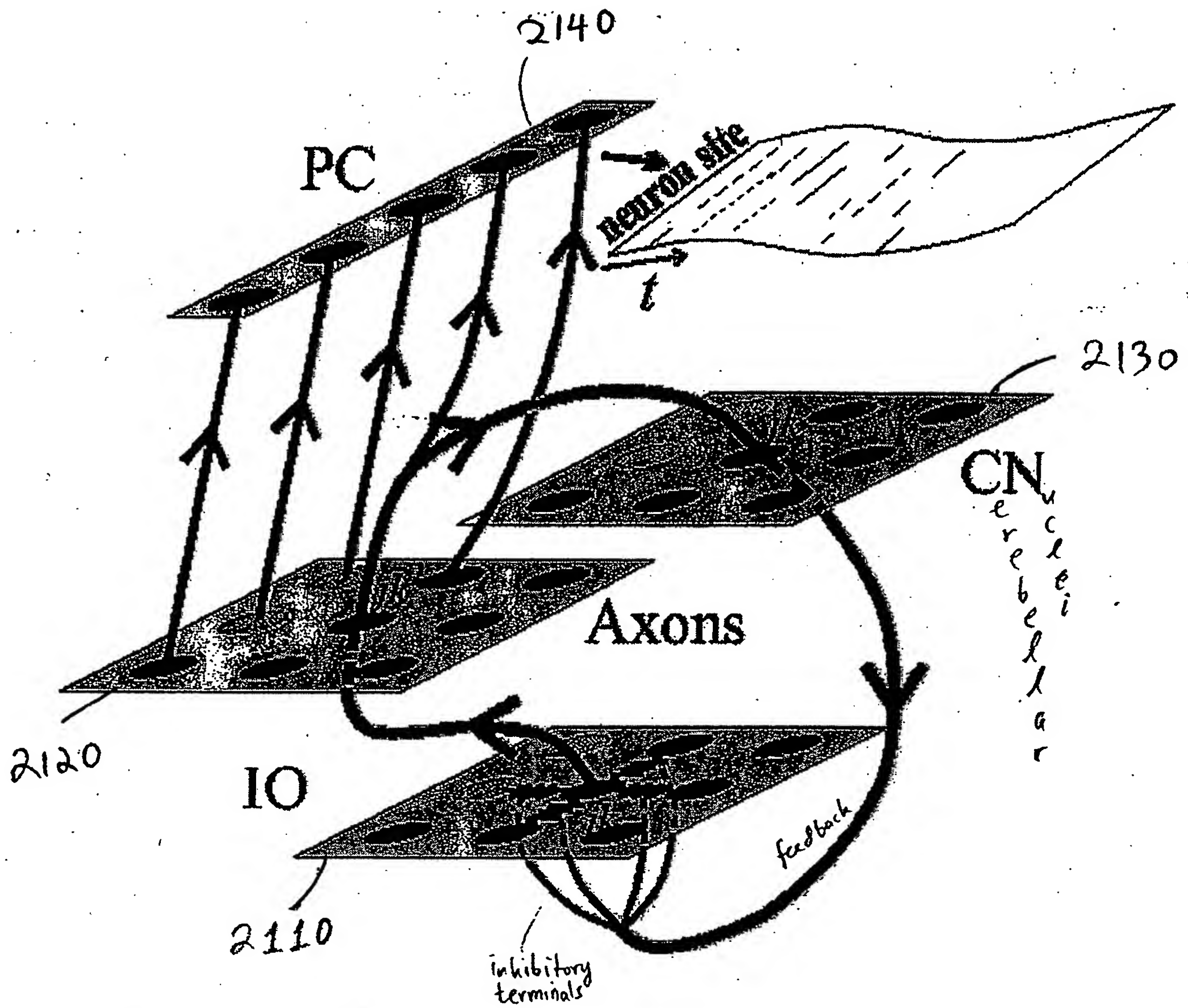


Figure 21

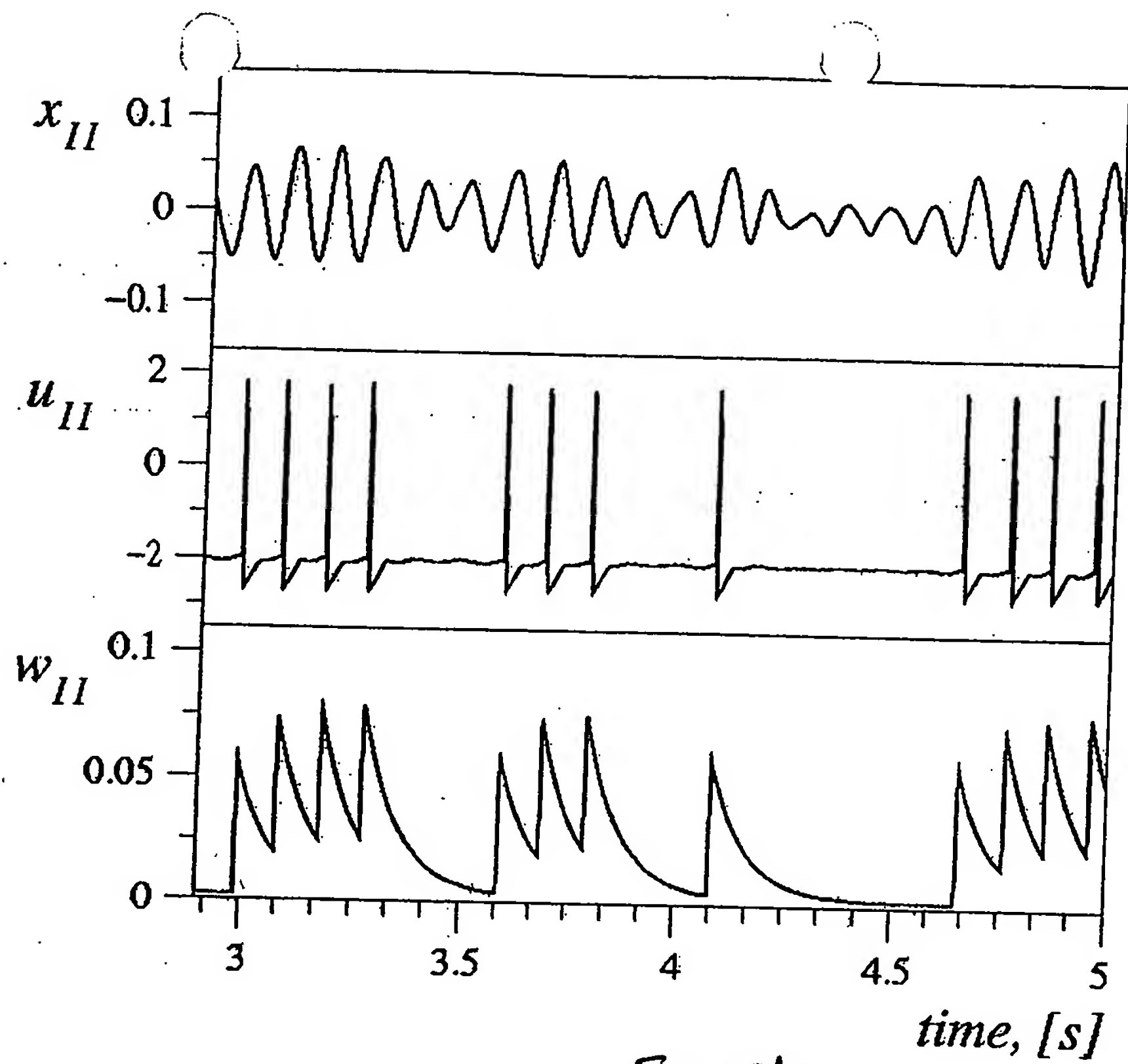


FIG. 22A

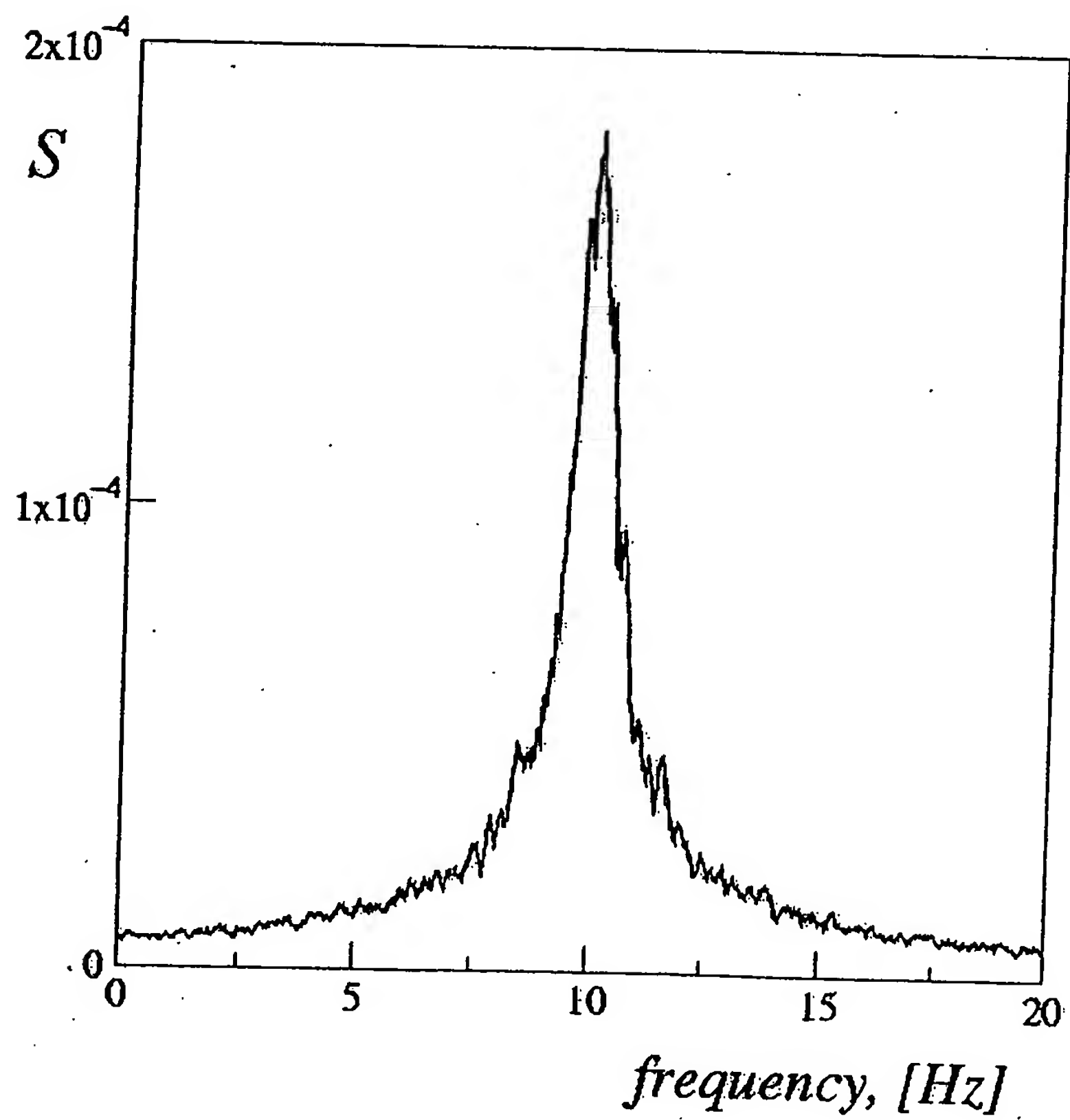


FIG. 22B

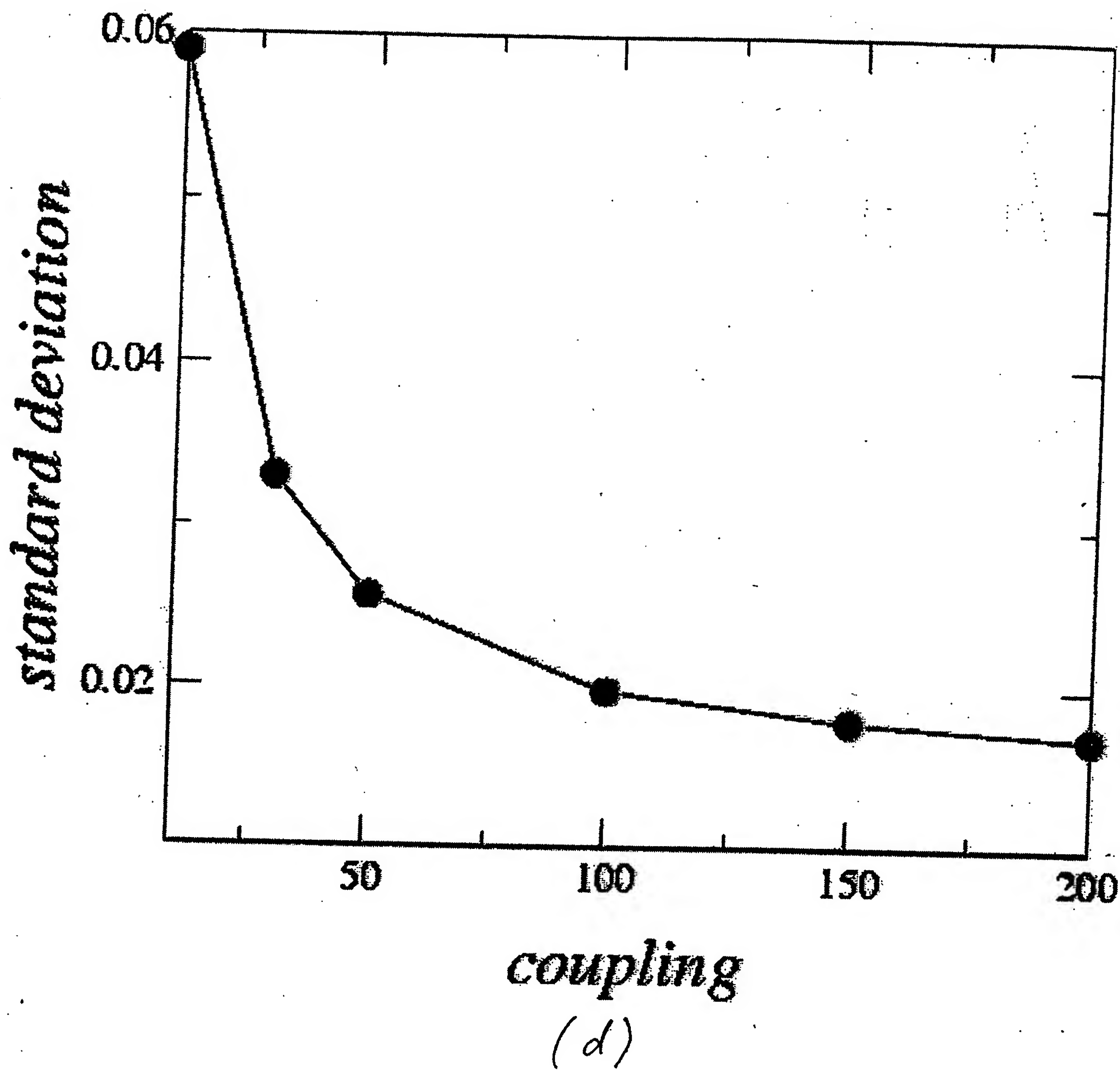


Figure 23



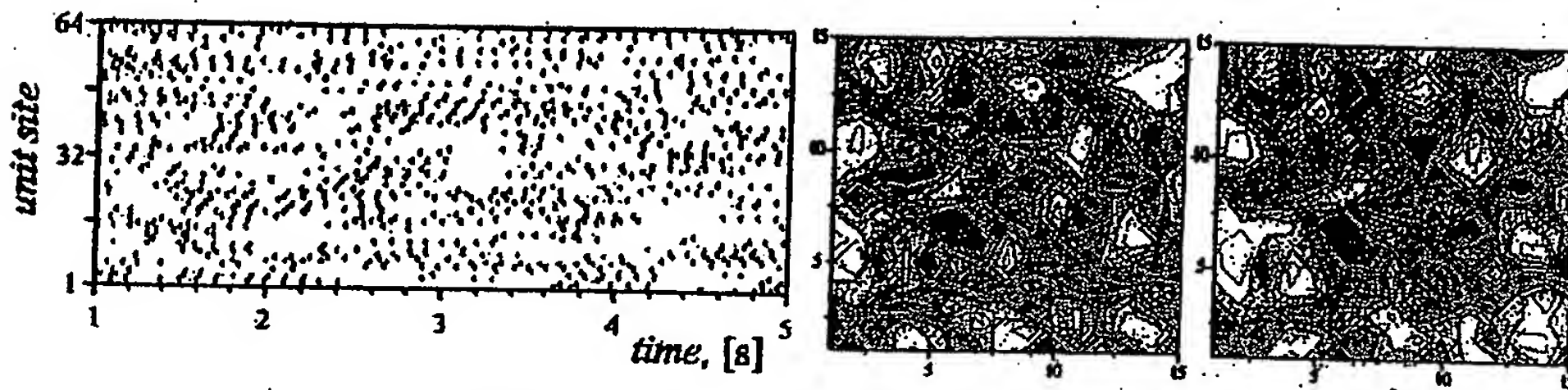


FIG. 24A

$$d = \emptyset$$

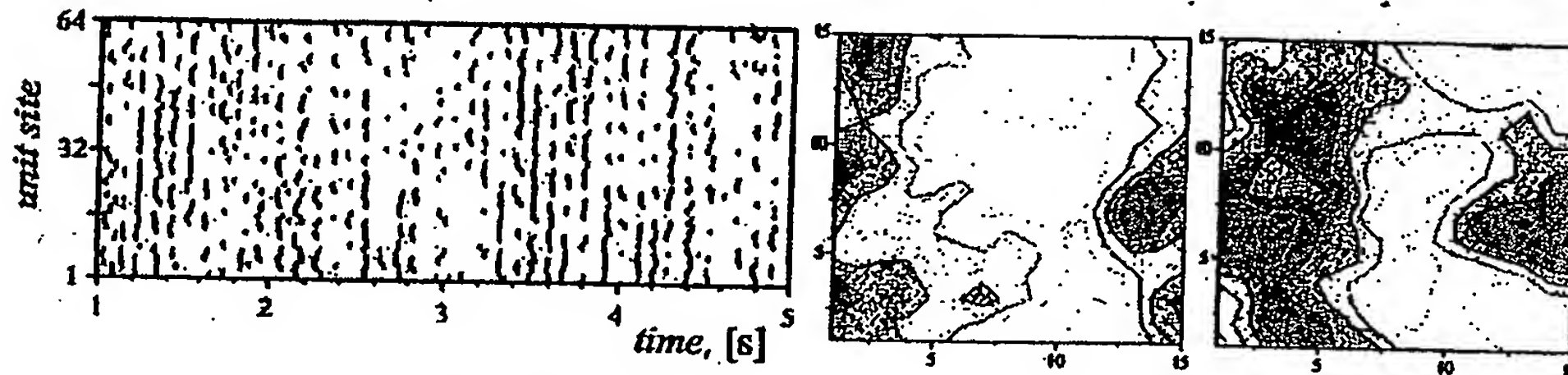


FIG. 24B

$$d = 5\emptyset$$

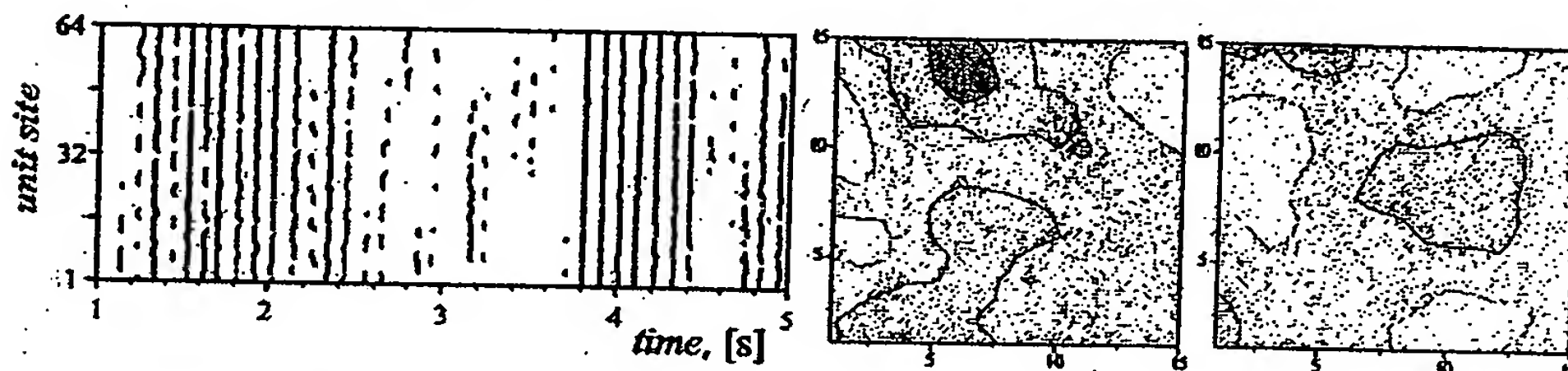


FIG. 24C

$$d = 200$$

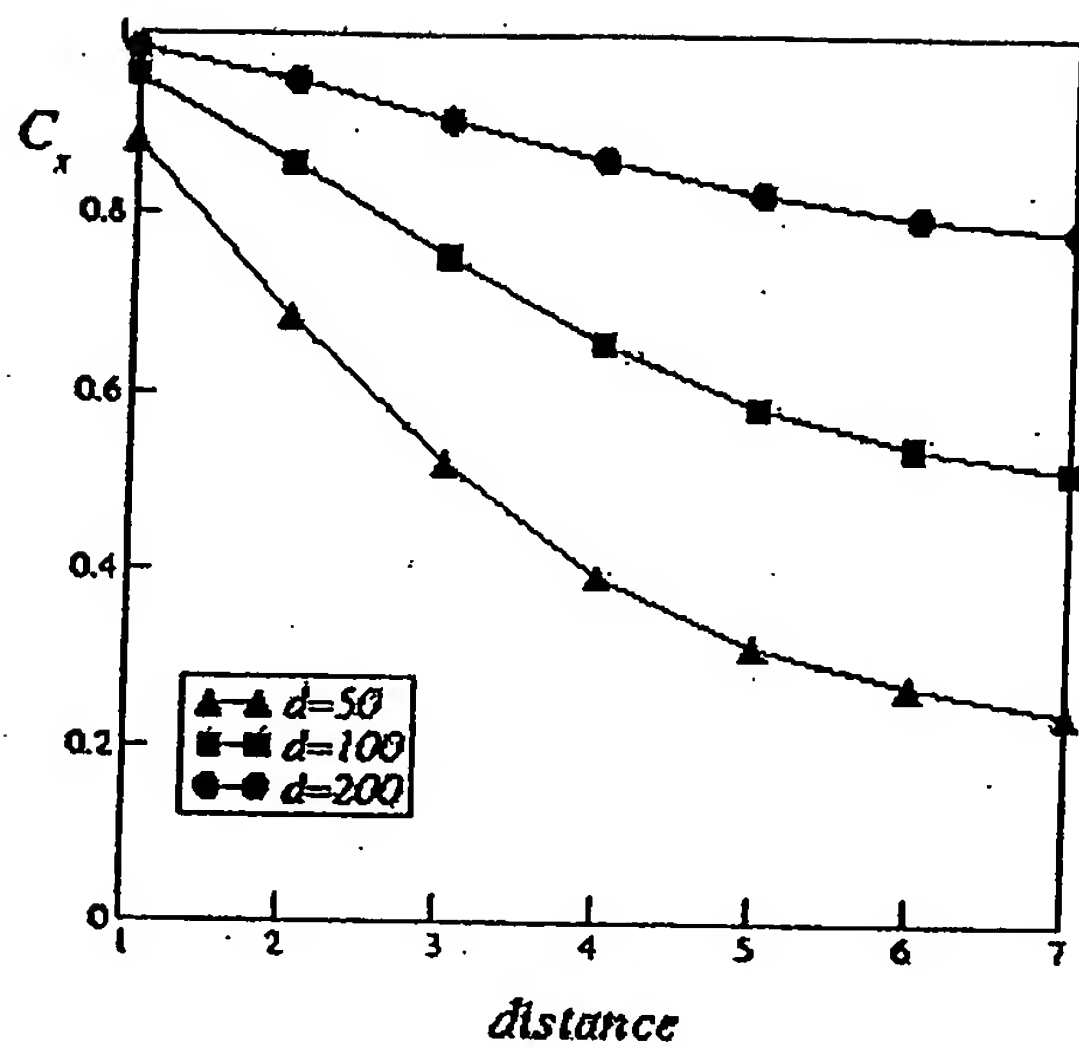


FIG. 25A

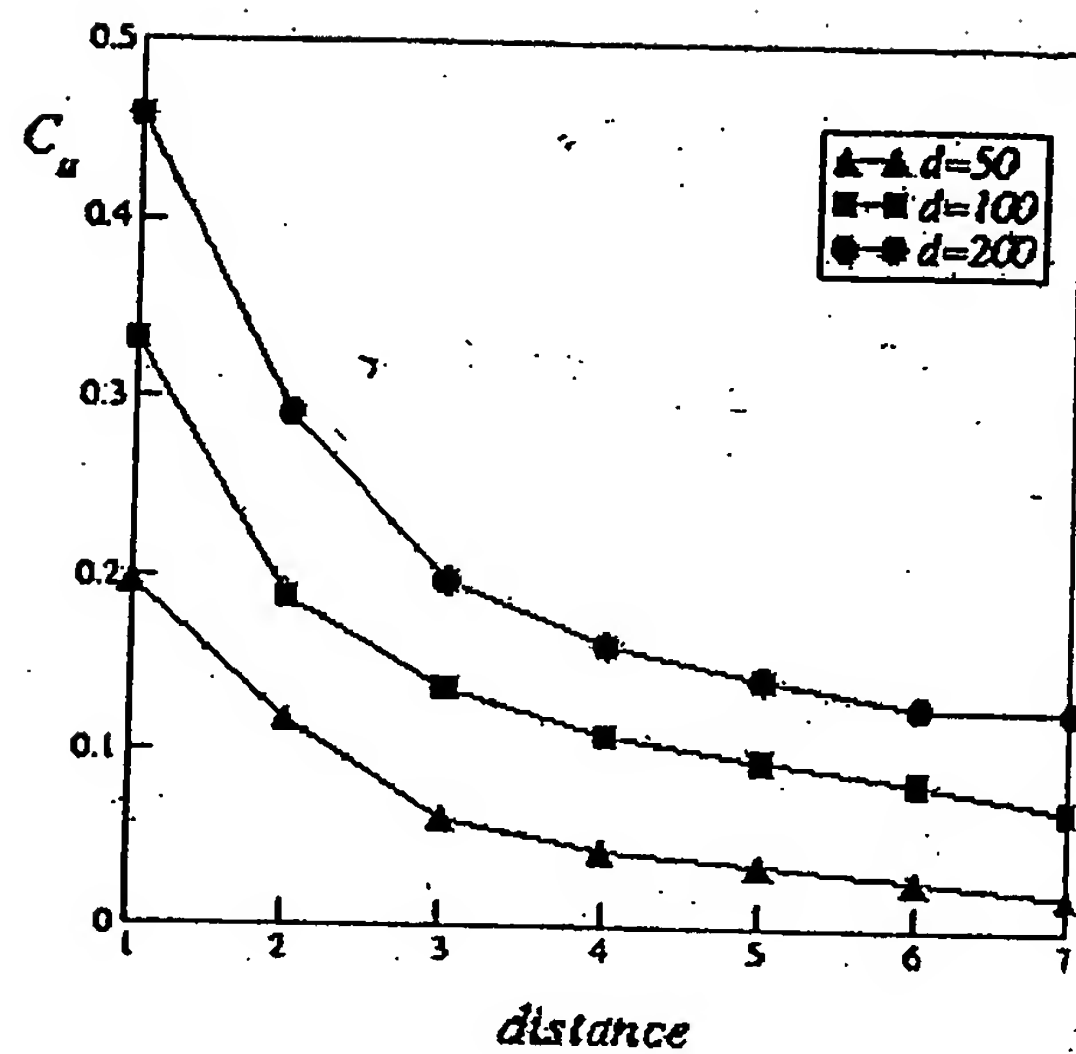


FIG. 25B

FIG. 26A

$w_{11}$

0.1  
0.05  
0

FIG. 26B

$w_{12}$

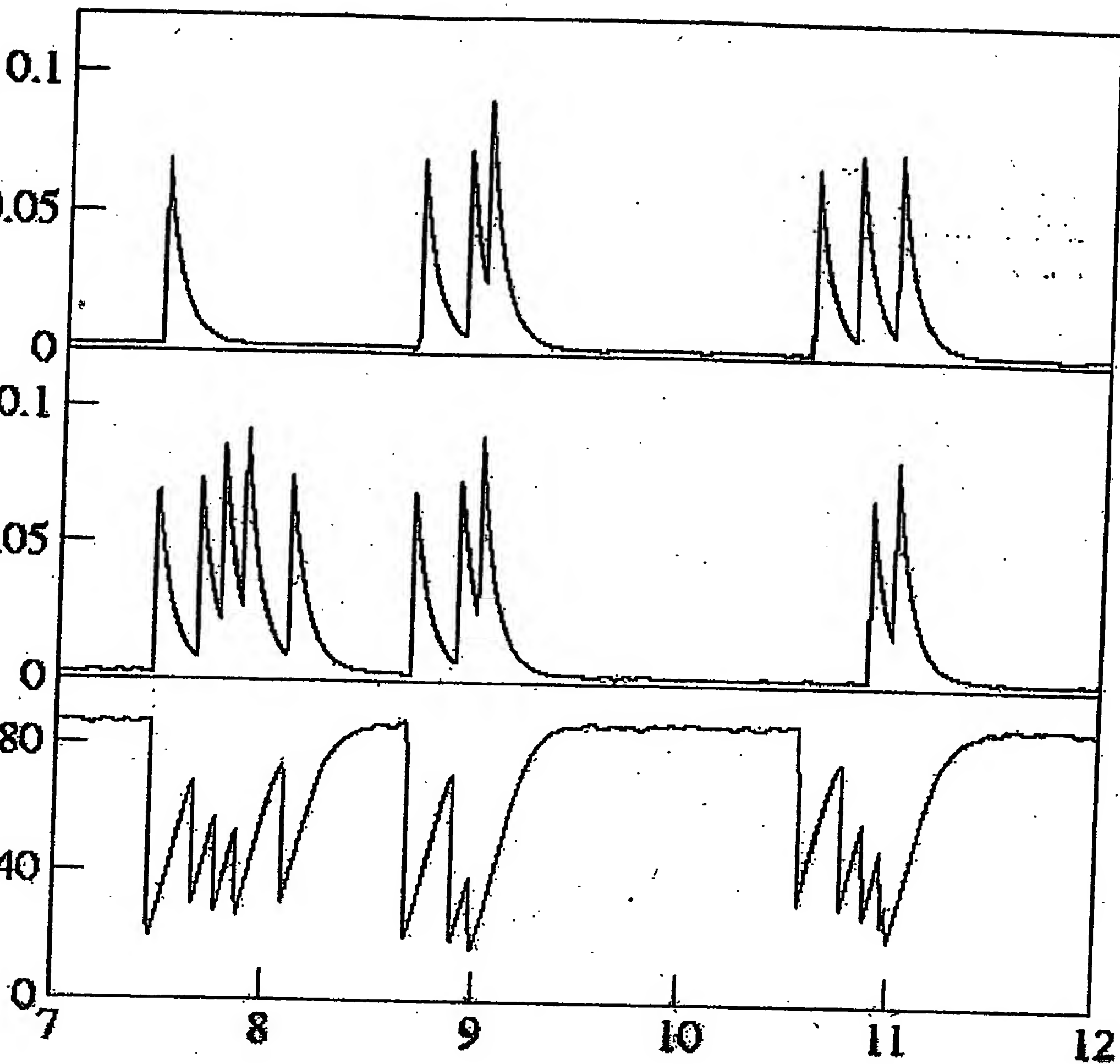
0.1  
0.05  
0

FIG. 26C

$d_{12}^{11}$

80  
40  
0

time [s]





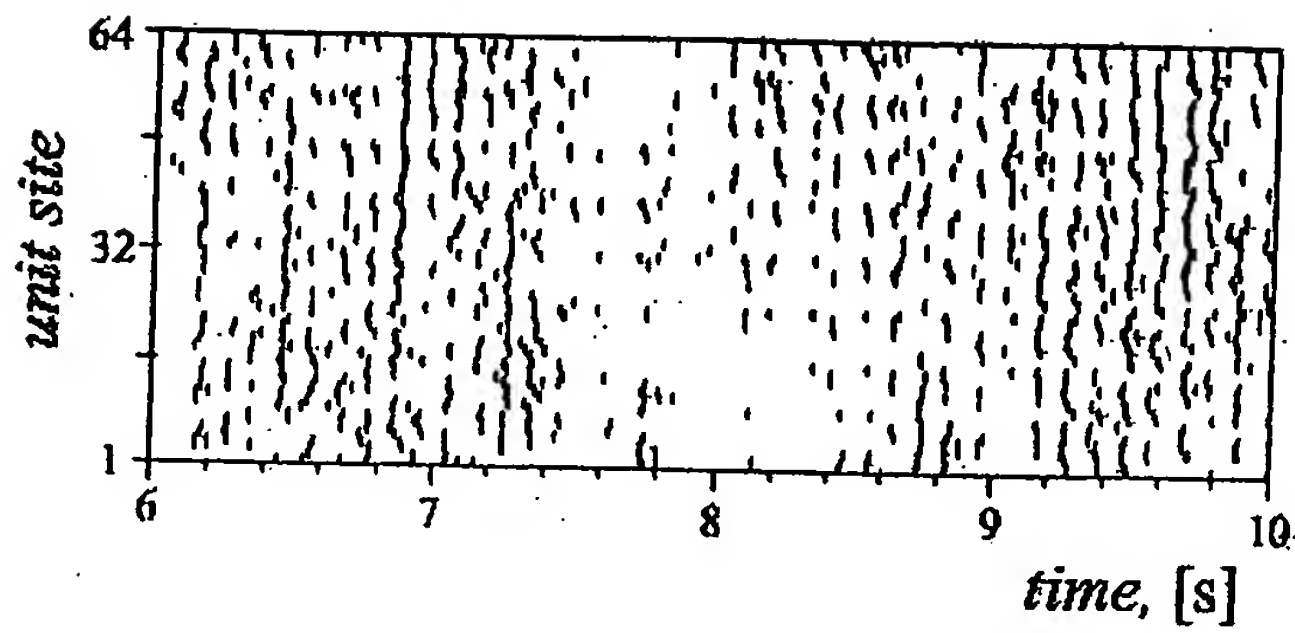


Fig. 27A

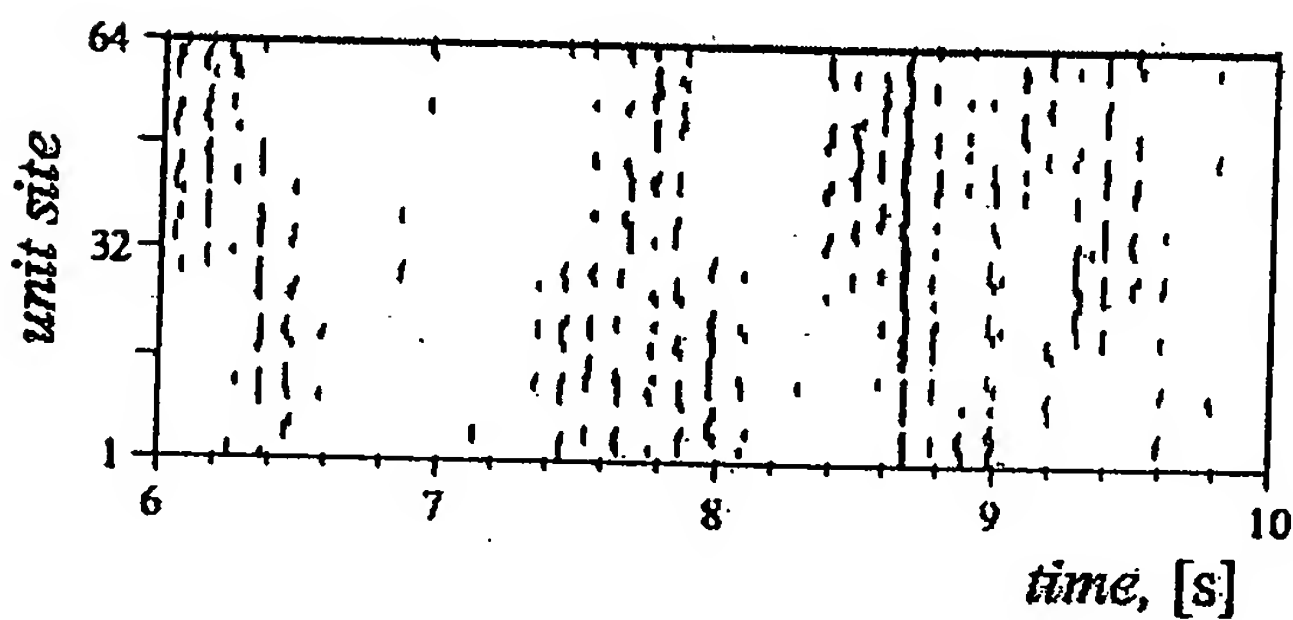


Fig. 27B

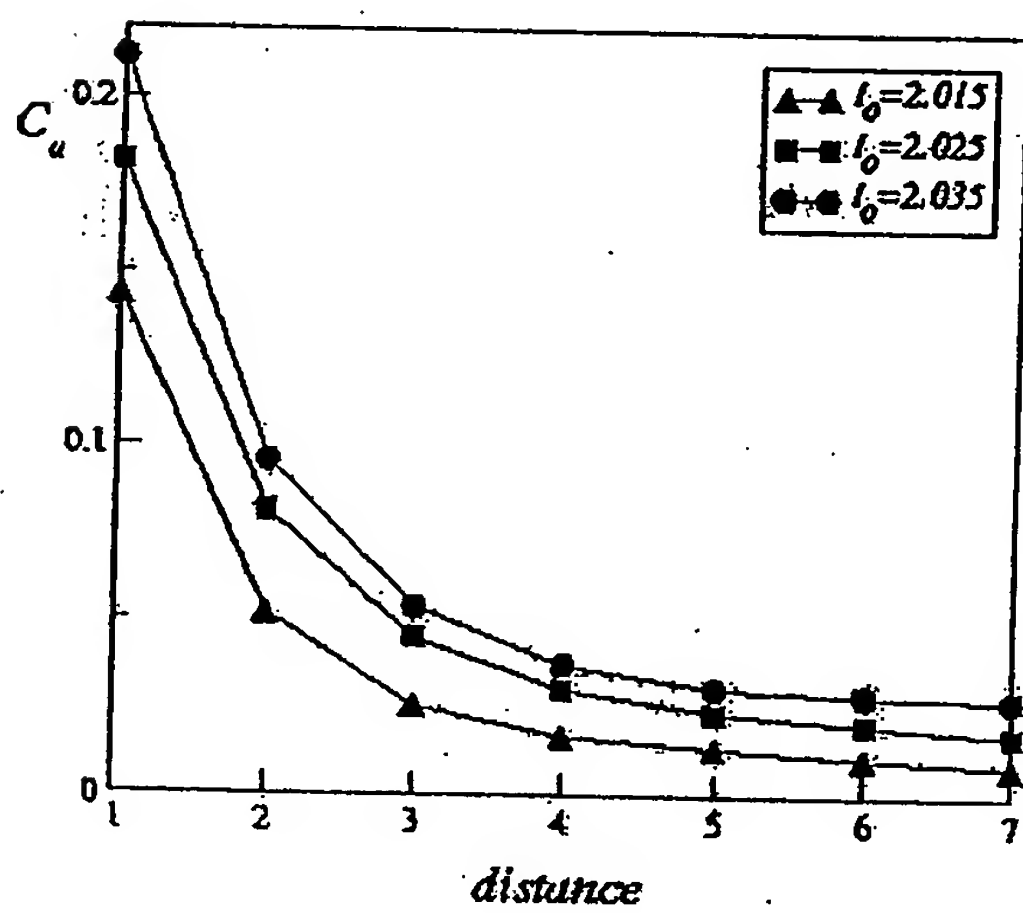
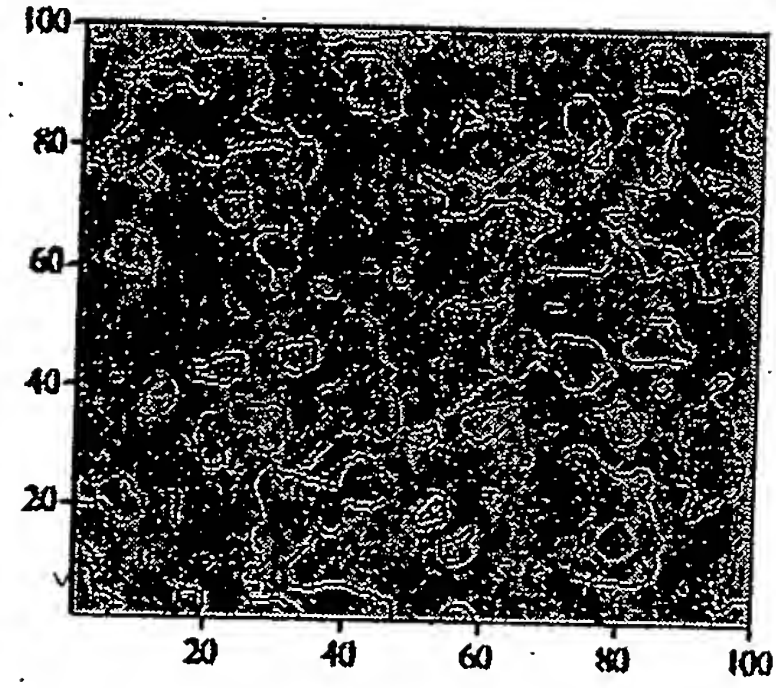
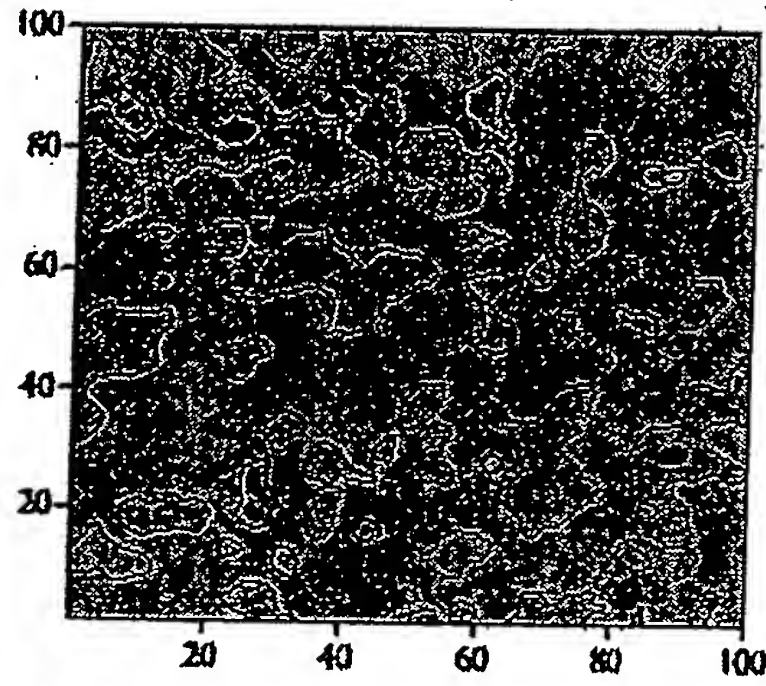
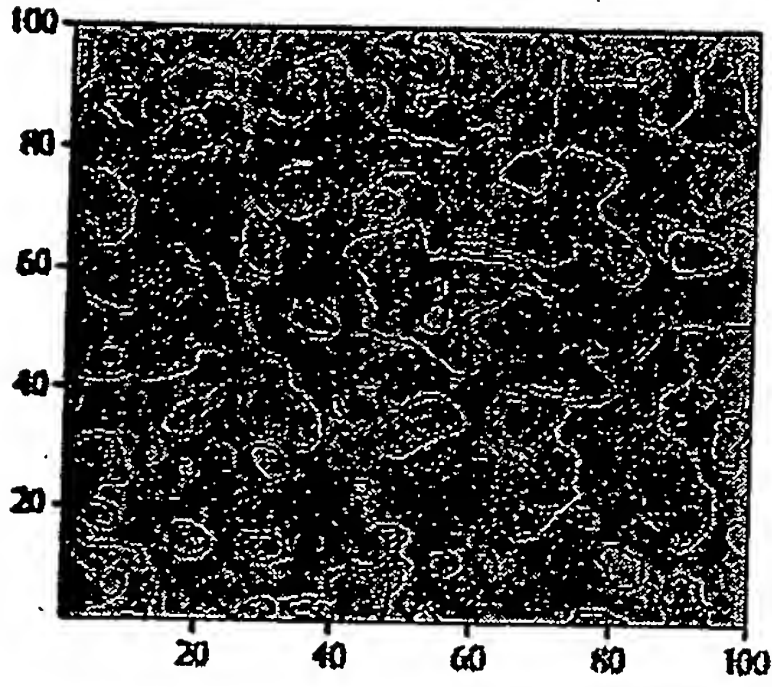
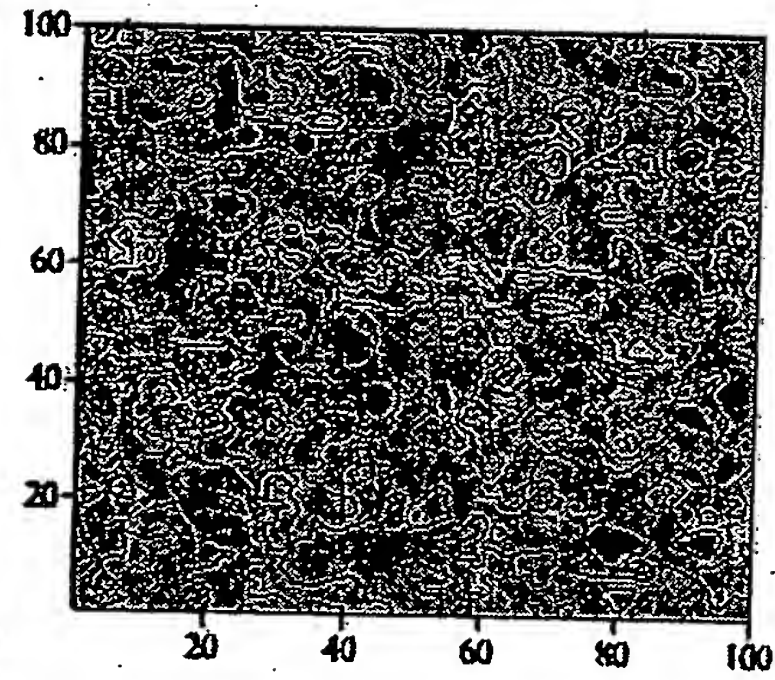
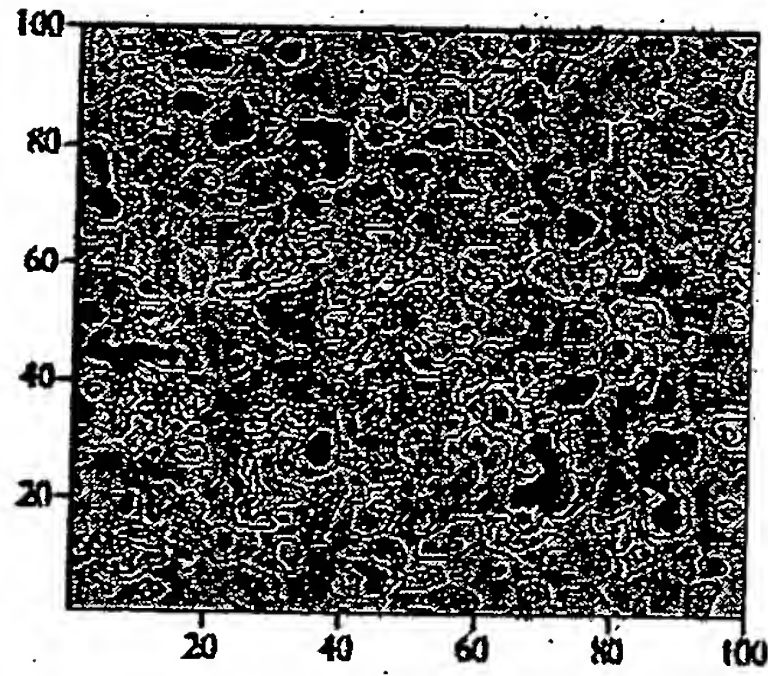
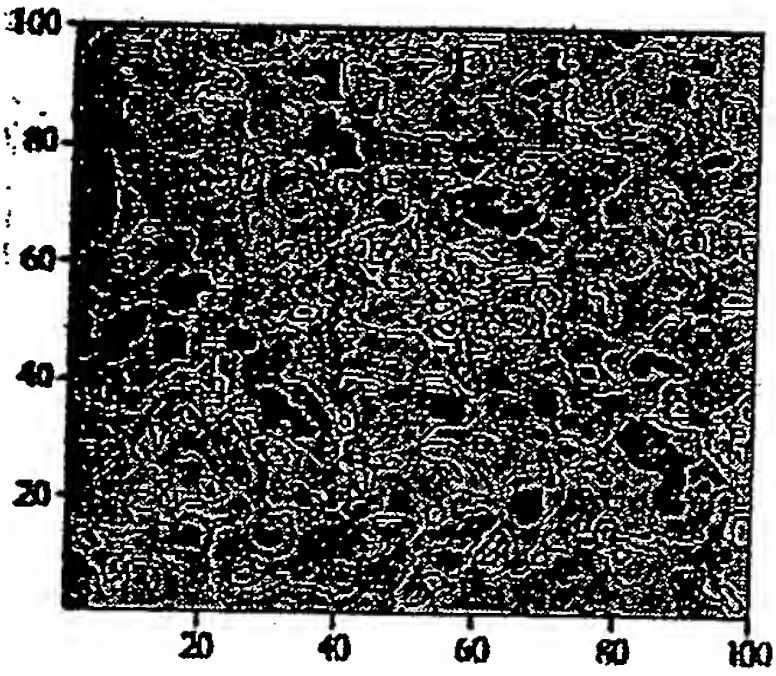


Fig. 27C



- constant  
coupling  
- no feedback  
( $\Gamma = \emptyset$ )

FIG. 28A



feedback  
 $\Gamma \neq \emptyset$

FIG. 28B

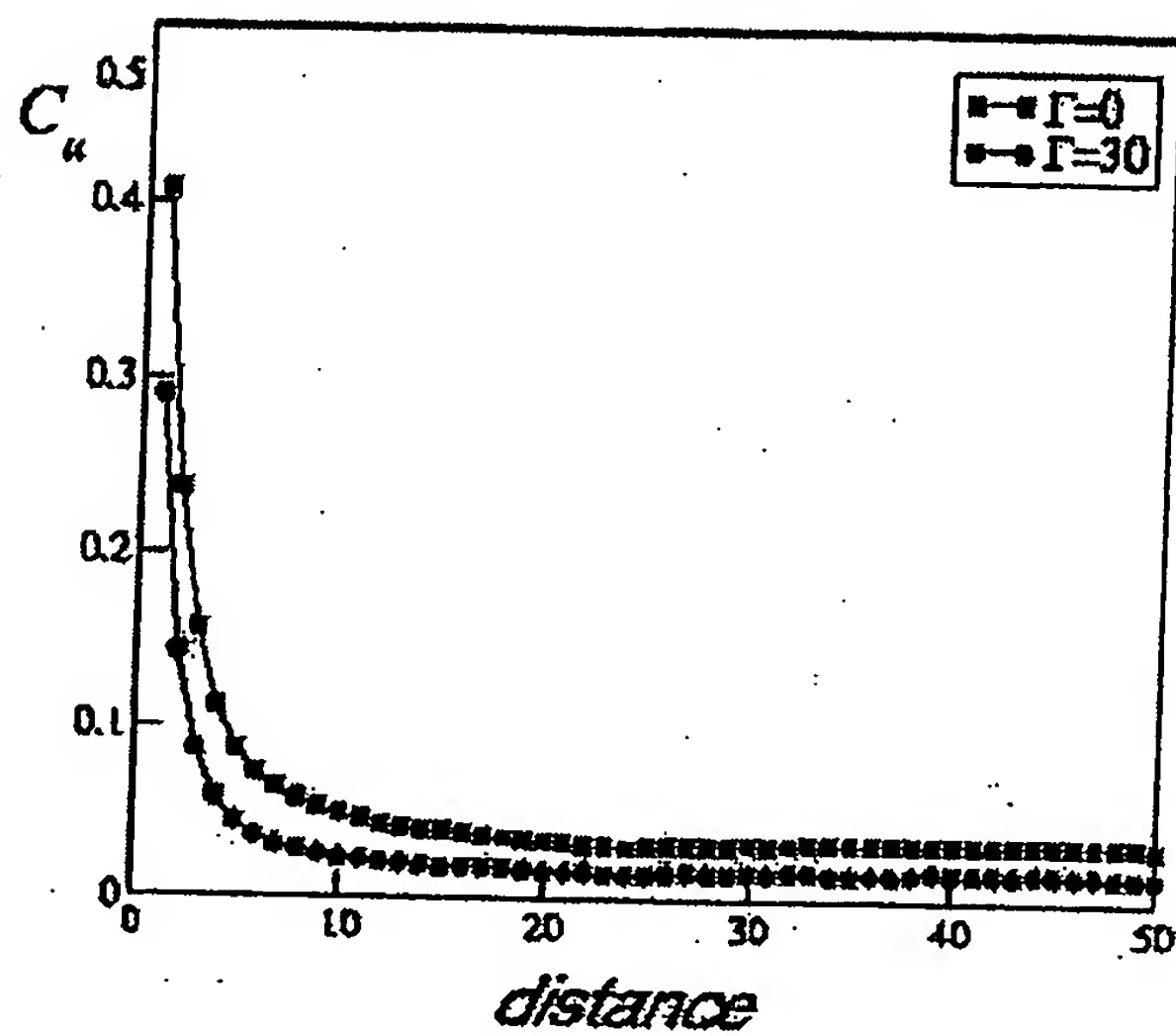


FIG. 29A

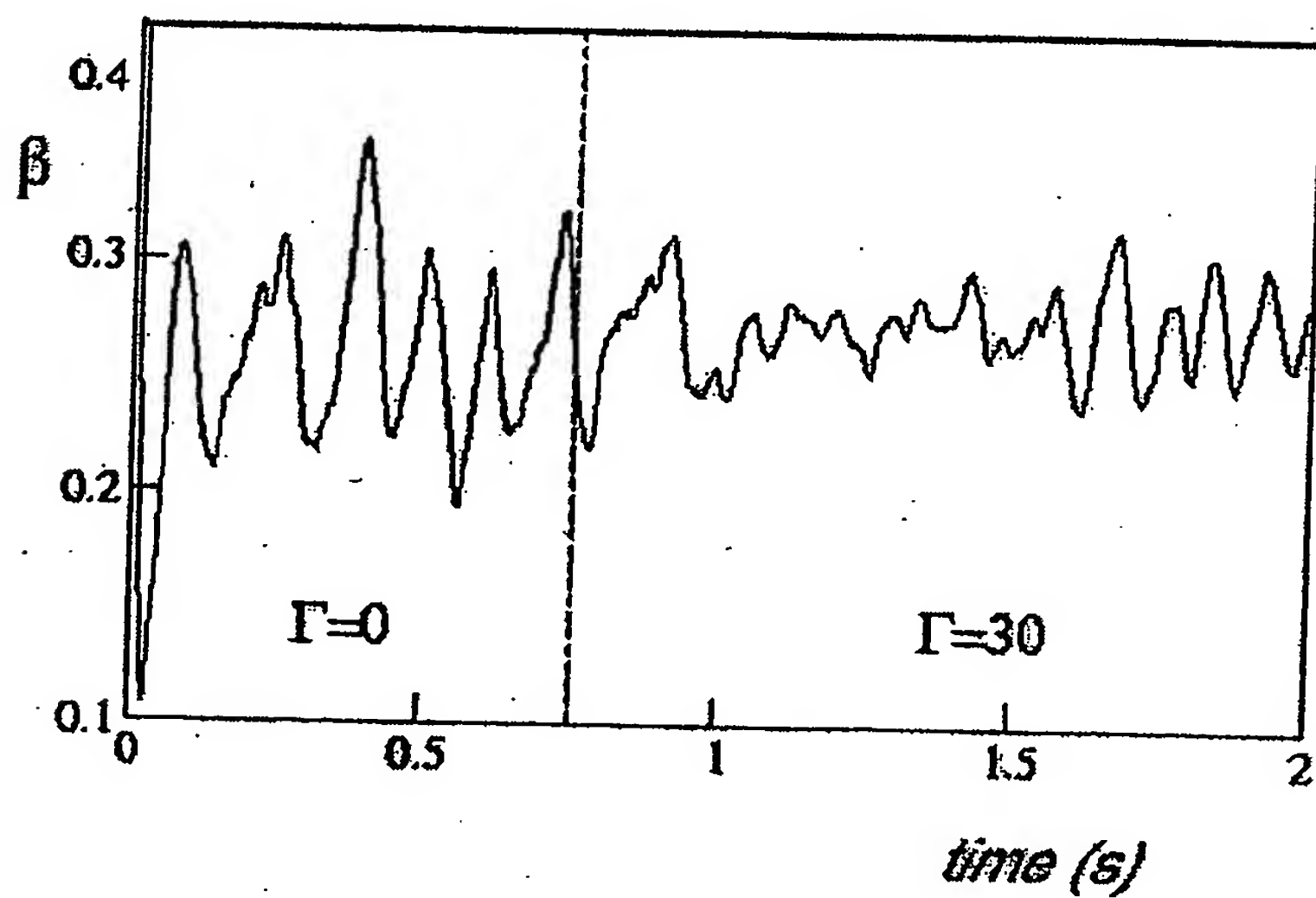


FIG. 29B

FIG. 30A

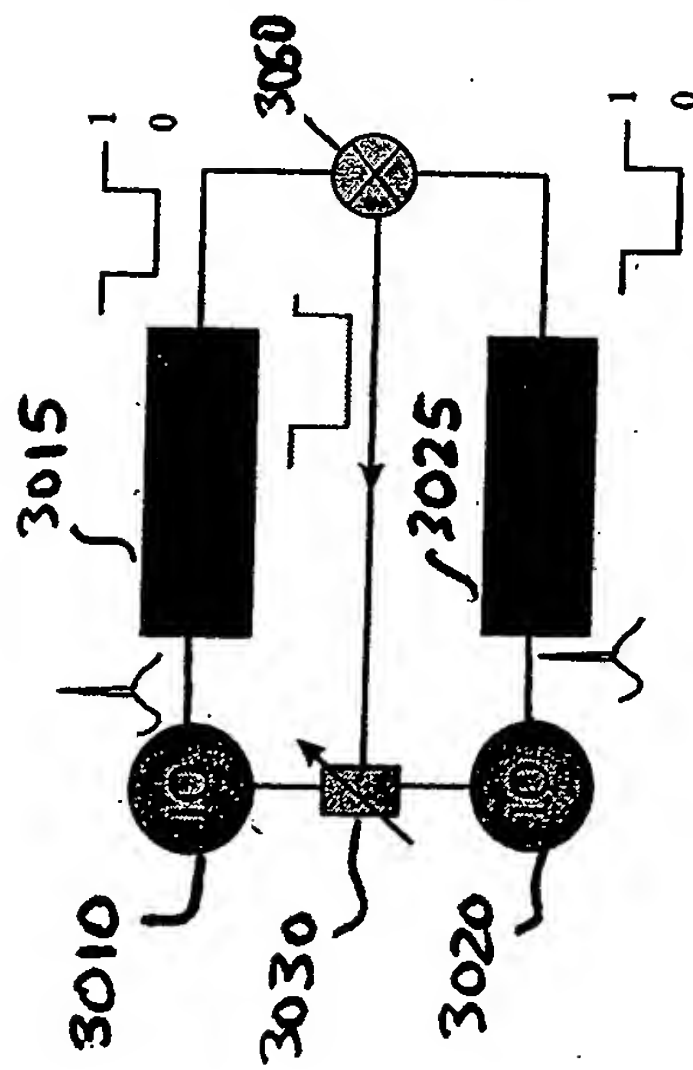


FIG. 30B

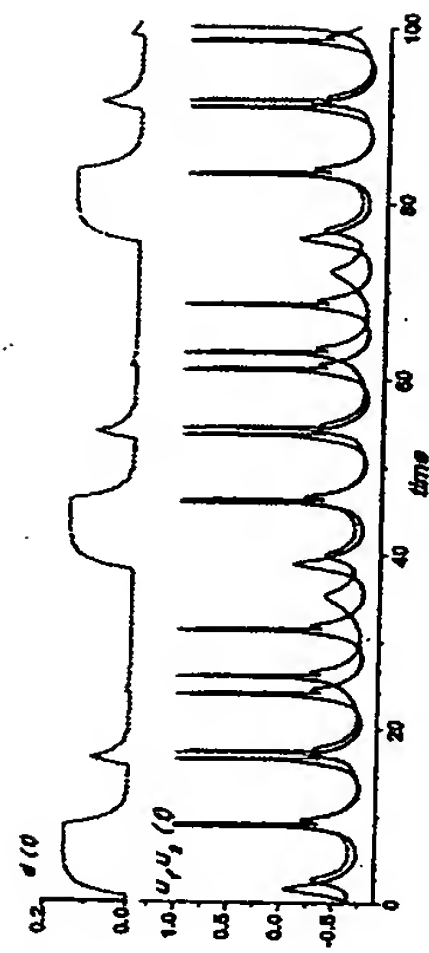


FIG. 31A

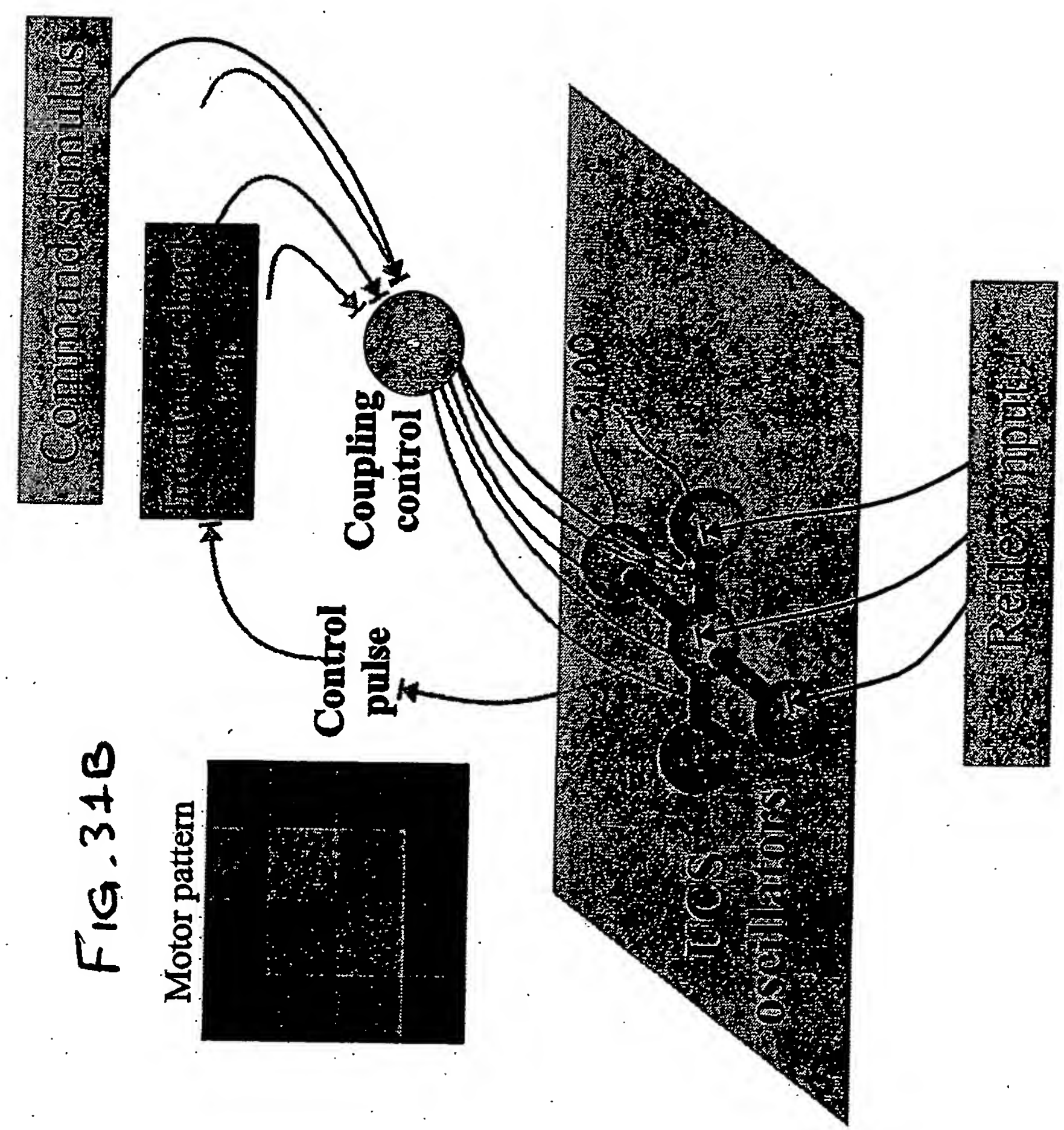


FIG. 31B

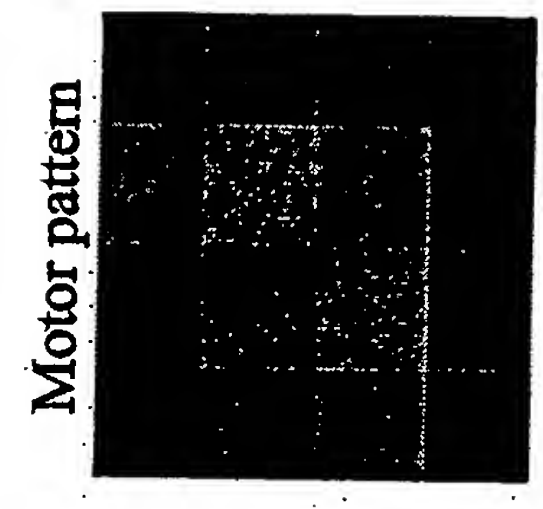


FIG. 32A

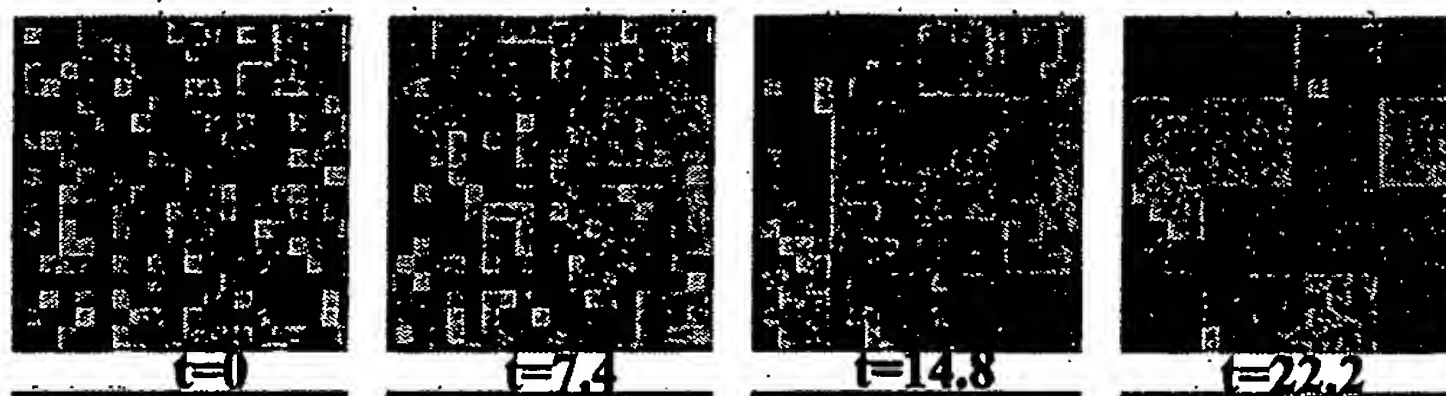


FIG. 32B



FIG. 32C

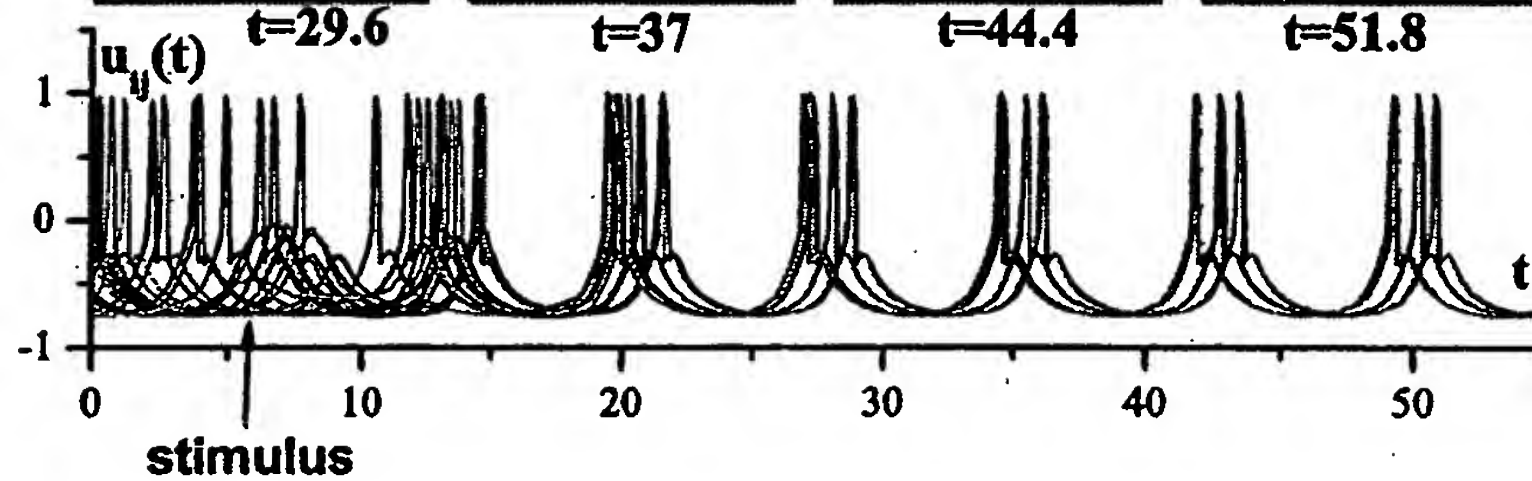


FIG. 33A



FIG. 33B

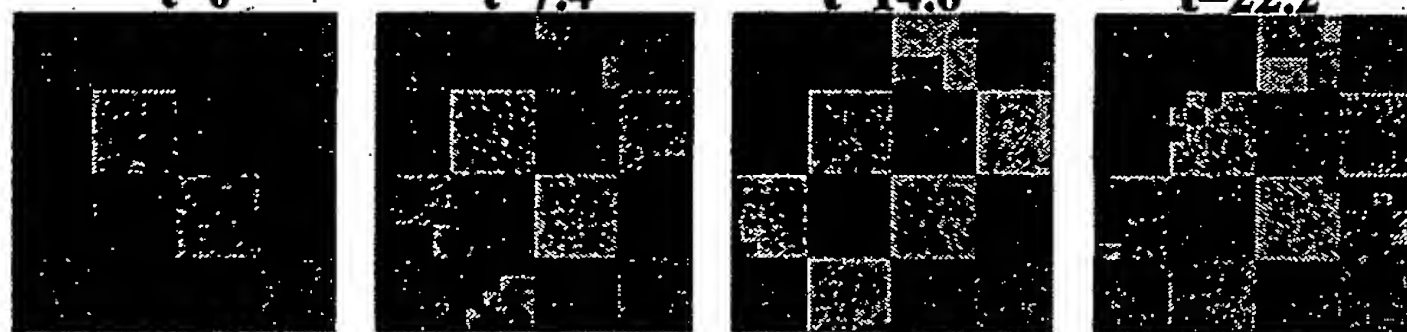


FIG. 33C

